

Bicycle Crash Investigation, Part II

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In the Spring 2007 issue of *IPMBA News*, we examined the fact that serious crashes involving bicycles quite frequently result in civil actions. Officers' investigations and reports get examined in detail by both sides. It is important that officers collect and document all of the factors involved. It is rare to find investigators with a background in bicycling, bike laws and cycling dynamics, and this article's purpose is to provide readers with a more comprehensive awareness of the pertinent bicycle issues.

Specific Concerns Unique to Bicycles

No one would do a crash report without recording the make, model and license number of a motor vehicle, yet bikes are often listed as simply a "bike." Record and photograph the make, model and serial number of the bicycle. Serial numbers are found in one of three locations: under the bottom bracket where the pedals are located, on the (rider's) left side of the top tube below the handle bars, and on the left side "dropout" where the rear hub attaches to the frame. On some high-end BMX bikes, it may be on the inside of the dropout. If there are more than two sets of numbers use the set on the left side or the forward most.

Frame Size

Bike size is often listed, incorrectly, by the diameter of its wheels. For example, BMX type bikes have 20-inch wheels, and mountain bikes have 26-inch wheels. Wheel size can be found by checking the side of the tires, but bikes are more accurately sized by measuring their frames. That measurement might be found on a sticker on the frame, but don't expect it. You will most likely have to measure it yourself.

A frame is measured from the center of the bottom bracket to the top of the seat tube. On mountain bikes, BMX and most other bikes, the measurement is listed in inches. Road bikes, or racing type bikes, have their frames and wheels measured in centimeters.

Knowing the frame size may help an investigator determine whether the bike was too large for the rider. Riding a bike that is too large is quite dangerous and may cause control problems. It may also be a violation of the law. A rider must be able to stand over the bike's top tube while standing flatfooted. If the rider was killed or seriously injured, the stand-over test is obviously impossible. Knowing the frame size may make it possible to determine whether it was safe by using the rider's measurements. Legally, the height of the frame is ultimately at issue, not the height of the saddle.

Tires

Bicycle tires have only a very small portion of rubber on the road at any one time. Even the best tires provide an actual surface area, on each tire, of approximately half the size of a dime. Most bike tires have even less area. That portion of the tire surface is the sole point of traction for acceleration, braking and turning. It is easily affected by wet or slippery surfaces.

Traction is particularly vulnerable when trying to brake hard and turn at the same time. The small surface area contacting the pavement cannot accommodate both actions simultaneously, and the loss of traction often results in a fall. Lugged or knobby off-road tires are designed to increase traction and surface area on non-paved surfaces. On pavement, however, the surface area of the tire is actually less and traction is poor, especially when the surface is wet. Tires play a significant role in the cyclist's ability to maintain traction and balance. Inspect and photograph the tires. Document their size, type and condition.

Accessories and Clothing

Any and all accessories mounted on the bike should be photographed. Any lights, reflectors or other safety devices should be documented. Some accessories or parts may have broken off and lay nearby.

These, too, should be documented and photographed as part of the investigation. Virtually every state in the United States requires bicycles to be equipped with – and use – a headlight if operated on a roadway at night or in low-light conditions.

Several states also require that bikes use a taillight, not merely a reflector, when operated at night. Check state statutes to see precisely what is required in your locale. If you are unfamiliar with the law, you may not know what needs to be verified and documented.

Some bikes are equipped with mirrors, and some cyclists use mirrors mounted to the side of their helmets. Bike mirrors in the U.S. need to be mounted on the left side of the bike to be effective in traffic. Bike mirrors are small. They allow the cyclist to see if a vehicle is approaching, but may not accurately depict distance, closing speeds and other important information. The cyclist should still look over his shoulder to get more precise information. Inexperienced cyclists may tend to swerve toward traffic when looking over their left shoulders. Statements from witnesses may indicate such movement if it is suspected.

Personal entertainment devices, such as MP3 players and iPods, are frequently used by cyclists, nearly all of whom use earplugs in both ears. It is not uncommon for them to be quite loud. Just as a strong headwind can make it difficult to hear vehicles approaching from behind, these devices make it nearly impossible to hear oncoming traffic. In a few states, they are illegal to use on a roadway. Because hearing is an important sense for surviving in traffic, use of these devices on a roadway is particularly dangerous. If the cyclist was using them at the time of the crash, it should be documented. If possible, note and document the volume level.

Brakes & Other Components

Bicycles today have a variety of brake types. They run the gamut from pedal-activated coaster brakes to high-end hydraulic disc brakes. The function of brakes should be tested, if possible. Check and document the condition of all components of the brakes. Are all of the cables and brake blocks intact and connected? Is it possible to tell if they are adjusted correctly? Keep in mind that statutes in every state require bikes operating in or near traffic to have functional brakes.

A factor that may affect children is the size and adjustment of brake levers. Occasionally, kids ride bikes that are too big for them. Their hands may not be able to physically reach the brake levers in order to activate them. Investigators should question that possibility if a child and hand brakes are involved in a situation in which the bike didn't stop when it should have.

Assess the overall mechanical soundness of the bike. If the frame, wheels or components are broken, it may be possible to tell if the damage is fresh or not. If there is any doubt, take the bike to a professional bike mechanic for an opinion about the bicycle in all mechanical aspects. A professional bike mechanic may be able to tell you if the damage was pre-existing, and if so, if it could have caused the cyclist to fall.

Bike mechanics can also examine brakes and other components to determine their functionality before the crash. They may have experience with that particular model and its idiosyncrasies. Occasionally bicycle companies or the Consumer Product Safety Commission issues recalls or warnings about particular bikes or components. A professional mechanic could share that info and bring another perspective to your investigation.

Pre-Crash Speed

Establishing the bike's pre-event speed is important, but may be difficult to determine. If the bicycle is a multi-speed model, photograph and document the chain position, both front and back. By looking at the gear combination, the type and quality of the bike, together with other factors, a cycling expert may be able to make a reasonable estimate of the rider's speed.

Statements from witnesses regarding the rider's body position on the bike, pedaling cadence, and perceptions of speed are all important to document. For example, a bike ridden slowly in a very high gear will be difficult to pedal and may be somewhat wobbly.

Skilled cyclists use their gears more efficiently and they regularly ride with a higher pedaling cadence. Less skilled cyclists tend to shift less and ride in gears that make them work too hard when pedaling. Each gear combination has a unique “stride length.” Each revolution of the pedals causes the bike to travel a certain, constant distance.

Higher gears travel a longer distance with each revolution of the crank than do lower gears. By counting the number of teeth on the rear cog and front chain ring that the chain is found in—and noting the tire size—it is possible to determine the stride length used by the rider. It then becomes important to ascertain from witnesses whether the cyclist was pedaling quickly or slowly.

It isn't unusual for a crash to knock the chain completely off of the drivetrain. It is more unusual for the chain to be bumped securely onto a different set of cogs. While gear position is not a foolproof means of determining the cyclist's speed, it is a very good piece of information to determine and document.

Secure the Bike

In fatality cases, and others that will likely end in criminal or civil court, it is always best to secure the bicycle in the condition it was found. Despite the number and quality of photographs, it is always best to have the actual bike to refer to and bring into court. Storage can be an issue, especially since a civil case may take years to go to trial.

Bike shops often have a number of the cardboard boxes in which new bikes are delivered. They would gladly share them with law enforcement instead of throwing them out! With little disassembly, it may be possible to secure the crashed bike in the box and store it as evidence. A lawsuit is normally filed within a year or two. The plaintiff's attorney may wish to take possession of the bicycle and other physical evidence at that time. Your department policy can dictate whether or not to release it for civil action.

Clothing and Equipment

The cyclist's clothing and equipment may significantly increase conspicuity, or visibility to other road users. It is suggested the clothing the cyclist was wearing at the time of the crash is collected and photographed. It may be helpful to lay it out as it was being worn to best present it as it was on the street. This usually requires going to the hospital or morgue where the cyclist was taken. Clothing may have been removed at the scene by medical staff or by the impact itself.

Photograph any removed clothing or equipment at the scene and, if possible, bring it with you when you photograph the rest of the clothing. If the cyclist was wearing a helmet, it should be saved as evidence. The helmet may help determine the amount of force and the area of impact. In some instances it may bear evidence as to whether it struck the vehicle, the road surface or multiple surfaces.

Road Surface

Where a bicyclist rides upon a roadway is often determined by the condition of the roadway and shoulder. A shoulder that is narrow, or has a crumbling edge or potholed surface, is unsafe for riding. So is one that is littered with debris. These conditions require a cyclist to ride on the right side of the traffic lane.

When a safe shoulder does exist, the portion of the shoulder that is closest to the roadway has less debris than the side nearest the gutter. To avoid debris, experienced cyclists often ride very near the fog line. Where a roadway has a concrete curb and gutter, it is unsafe to ride in the gutter as gutters collect debris and may also be a grade either higher or lower than the adjacent asphalt.

When assessing whether a cyclist was in a portion of the roadway where he “belonged,” investigators need to be aware of the hazards created by curbs and gutters. Nearly all state statutes have the language that a cyclist must ride as “far right” or “as close to the right side as practicable.” “Practicable” essentially means safe. Since gutter riding is unsafe, the language does not require bicyclists to ride in the gutter.

On occasion a cyclist may choose to ride in the gutter. Inexperienced cyclists, intimidated by traffic, often move as far right as possible to get out of the way of an approaching vehicle, often a truck or other large behemoth. This sets up another potential hazard.

If the cyclist moves too close to the curb, he may actually strike it with the bike's closest pedal. Doing so can cause the cyclist to launch himself out into the traffic he was trying to avoid. If this is suspected, it may be possible to find evidence of the pedal strike by inspecting both the pedal and the top of the curb.

An recently popular engineering feature are shoulder rumble strips. These are most often installed on higher-speed highways with infrequent bicycle traffic. They are intended to awaken sleepy, distracted or intoxicated drivers to the fact they are leaving the traffic lane. The rumble strips are unsafe and unrideable for most cyclists, but especially for road cyclists.

Road cyclists ride light bikes that have no suspension, use narrow tires and drop handlebars. Road cyclists avoid rumble strips and will use whatever part of the roadway is available to steer clear of them. If investigating a crash where they are installed, be conscious of their possible involvement. Measure the width of the shoulder and traffic lanes to help determine if there was sufficient space for the cyclist to ride.

Conclusion

The things to take from this series are fairly simple. First, you cannot take too many photos of the bicycle, accessories and damage to the car. Shoot every little detail, both distant and macro. Photograph the clothing worn by the cyclist. Interview witnesses who saw the incident. Examine and measure the roadway and shoulder at least one block prior to the crash scene, if in question.

Review the bicycle statutes in your state. If necessary, call a trained bike patrol officer to the scene to help with the investigation. Preserve the bicycle for later examination. Finally, prepare a detailed report that will make obvious your investigation was thorough and impartial when it is reviewed months and years down the road.

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