

# **Motorcycle accidents – case studies and what to learn from them**

Ecker, H.

Vienna University of Technology,

Wiedner Hauptstr. 8-10/E325, A-1040, Vienna, Austria

## **ABSTRACT**

Three different cases of motorcycle accidents are presented. First the accident situation is described and the location is shown in a couple of photos. Then the most important facts about the accident analysis are discussed and possible causes for the accident are derived from the analysis. Last but not least, these causes are discussed and viewed from a more general point of view, and recommendations are made about the driving behavior of motorcycle riders and how to avoid repeating errors others have made. Finally, it is suggested that (more) motorcycle accident reports are published and made available to the public, especially to rider schools and motorcyclists, with the goal to facilitate the access to such reports for motorcycle riders.

## **INTRODUCTION**

The analysis of accidents is necessary and useful in several ways. In the case of traffic accidents frequently a punishable offence or a lawsuit may require a detailed investigation and reconstruction of an accident. Vehicle manufacturers are interested and sometimes forced to look into accidents that occurred with their products, in order to identify design weaknesses and potential for improvement. Highway and road departments in many countries are required to keep track of traffic accidents, identify possible causes and, in case of a significant accident frequency at a certain road section, improve the road and/or traffic situation and conditions. Last but not least, such accident analyses can also be quite educational for driving instructors as well as for ordinary drivers, since they discuss real world examples of accidents and therefore arouse people more easily, compared to statistical data and theoretical examples.

In the field of aviation accidents, it has become a standard all over the world to investigate every accident with fatalities and also accidents above a certain level of severity. Moreover, these reports are available to the public in certain countries. For example, the NTSB (National Transportation and Safety Board) in the U.S. has such reports on aviation accidents ready for download on their web page. In some aviation magazines these reports are adapted and published to give the readers the opportunity to learn from the mistakes others made and hopefully not repeat them.

There are some similarities between general aviation and motorcycle riding. Many GA-pilots and also many motorcycle riders operate their vehicle infrequently and only during leisure time. Flying an aircraft and riding a motorcycle are both considered as activities on a high risk level. Safe operation of both vehicles depends to quite some extent on the environment and on weather

conditions. Discussing the risks of one's favorite leisure time activity, however, studying and learning from errors others made, is much more common in general aviation. One reason for this observation might be that there are lots of statistics published on motorcycle accidents, but case studies are rare and hard to find.

The following three cases of motorcycle accidents are only briefly discussed and are not meant to be full and thorough reports on the respective accident investigations. The purpose is to trigger and initiate publishing of accident reports in whatever publication medium is appropriate, to educate motorcycle riders based on such reports and provide the opportunity to learn from them. Related references to topics raised in this introduction and in the following case studies are provided at the end of the article.

## **CASE 1**

### **Accident description**

A driver refueled his compact car at a gas station and drove away from the place via one of the exits, see Fig.1. Instead of turning right at the exit, as a road sign near the exit dictates, he crossed the adjacent three traffic lanes and stopped at the double-lined median of the road, see Fig.2. When he was about to cross the double-line, not in keeping with the regulations, a motorcycle approached the car from the left. The rider, driving along the road as shown in Fig.2, tried to stop his bike, but the braking manoeuvre was not successful and he crashed into the car. The driver of the car was unharmed; the motorcycle rider was lucky and suffered only from minor injuries. See Figures 3 and 4 for the severe damages of the vehicles.

### **Probable cause**

There is no doubt that the car driver did break the traffic regulations by crossing the road instead of turning right. His traffic violation was the primary cause for this accident. There is, however, also the question, whether this accident could have been avoided by the motorcycle rider. As one can see from Fig.2, it might have been possible for the motorcycle rider to see the car crossing the road early enough, to start a braking action and avoid the accident. Whether the accident was avoidable for the bike rider or not, is a question of timely (or delayed) reaction time, of proficient operation of the brakes and, last but not least, of the velocity on approaching the scene. Skid marks produced by the rear tire of the motorcycle and the deformations of the vehicles did suggest that the speed of the motorcycle was, at least, above the maximum speed allowed on this road. Also the skid marks did show that the braking manoeuvre was aborted several meters before the crash. The motorcycle rider did give evidence that he wanted to make a swing to the right to avoid the crash and pass behind the car. This evasive action was started too late, to be successful. Therefore, excessive speed of the motorcycle and possibly also the inappropriate braking action of the rider contributed to the accident.

### **Lesson to learn**

Many motorcycle accidents are triggered by wrongdoings of other road-users. Knowing that an accident wasn't his or her fault might give a motorcycle rider some satisfaction, but this does not really relieve the pain from injuries. Therefore, assuming that others make errors and violate traffic regulations, and taking this into account when driving, is mandatory for a long life as a biker. Some situations cannot be anticipated even with a sixth sense in situation awareness. In such a case it pays off being slow and knowing how to operate one's bike. Proficiency can be a life saver and something every motorcyclist should work on constantly..



Figure 1



Figure 2



Figure 3



Figure 4

## CASE 2

### Accident description

A motorcycle rider was driving on a country road. While following the road, which makes a gentle right turn, he approaches a bicycle rider from behind. Figure 5 was taken in opposite direction of the direction the bike and the bicycle were going and shows the right turn of the road in the background. As the motorcycle rider wants to pass the bicycle rider, both riders and vehicles collide and slide off the road into the grass. Both accident victims were severely injured and have no memories of the accident. Skidmarks and traces of fluid, which had escaped from the motorcycle were found on the road, see red markings on Fig. 6. Windshield, head lamp and instrument panel of the motorbike were almost completely destroyed by the collision, as shown in Fig.7. The bicycle was deformed and bent, with a cracked frame and a sheared off left pedal, see Fig. 8.

### Probable cause

As both riders have no memories at all about the accident, the analysis of this crash is based completely on deformations and traces found on the vehicles and on the road, respectively, as the only evidence. The analysis suggests that the bicycle rider turned left to cross the road in an attempt to reach an off-road area on the opposite side, maybe to have a rest. He did not pay attention to traffic behind him and neither looked back nor did he listen to hear approaching

traffic timely. The motorcycle rider probably did maintain an appropriate speed. Since there is no evidence of a braking manoeuvre of the motorcycle, the rider was either surprised by the action of the bicycle rider or tried to make an evasive manoeuvre, which failed. Direction of sunlight in combination with tall trees next to the road might have created shadows on the road, making it harder to recognize a bicycle in the dark. One of the questions in the course of the accident investigation was, if the possibility exists that the bicycle rider did maintain a straight direction and that just a grazing contact occurred, due to careless passing of the bike rider, i.e. with a lateral distance being too small. Rubber marks on the bicycle frame, originating from the bike's front tire, did show that this assumption is very unlikely.

### Lesson to learn

This again is a motorcycle accident caused by another road-user. As speeding can be ruled out for the motorcycle from a crash analysis, there is rarely anything one may reproach the bike rider for. So what to learn from this case? It may sound like a paradox: slow moving road-users like bicycles and pedestrians can change their direction of motion more rapidly than a fast moving vehicle. Therefore, extra care ought to be exercised when approaching and passing them. Keeping a distance as large as possible and as reasonable will minimize the risk of a sudden encounter of the dangerous kind. Also one may not underestimate the consequences of a collision with a pedestrian or bicycle rider. Although the mass of such an accident opponent is much smaller compared to a passenger car or even a truck or bus, the results of a collision may still be very severe, as this unfortunate case demonstrates.



Figure 5



Figure 6



Figure 7



Figure 8

## **CASE 3**

### **Accident description**

A motorcycle rider stopped close to a traffic sign at a road intersection of a two-lane downtown road, see Fig. 9. When there was no more traffic coming from the right, she accelerated her bike to turn left onto the two-lane road. For some unknown reason the motorcycle rider lost control of her bike. Still struggling to stabilize her motorcycle she crossed the walkway one can see in Fig. 10, and barely managed to avoid fully hitting the concrete column. Contact was made however, by the left foot and the footrest. The wild ride ended beyond the hedge on the small lawn. Feeling pain in her left foot the biker took off her left boot and noticed with horror that one toe had been cut off by the accident.

### **Probable cause**

It was not possible to find out why the motorcycle rider lost control of her bike. As she did not, or did not want to remember what happened initially, this is left in the dark. There is a conjecture that the side stand has been extended during the stop, but not retracted when moving on. However, this possible cause could not be proved. The seemingly more mysterious fact is the severe injury the lady suffered from the accident. The left boot seems to be fully intact, see Fig. 11, and does not give a clue on how this could have happened.

It was necessary to cut off the upper part of the boot from the sole and this did reveal what had happened. Obviously boot and foot were squeezed between the concrete column and some part of the motorcycle engine or frame. The sole did not withstand the lateral pressure and did collapse, which means break and fold. The sole is composed of different layers, with the one on top being made from a rather thin but stiff material. This top part of the sole separated from the layers below and folded upwards on the outer (left-hand) side. The folded up section of the sole was sharp and stiff and acted like a knife, which literally did cut off parts of one toe. Figure 12 shows a dark spot on the sole in the area where it was folded up by the accident. The dark color comes from blood which escaped from the wound. It was possible to reproduce the folding behaviour of the sole in laboratory experiments and prove that, in certain situations, this motorcycle boot can be harmful to the person wearing it.

### **Lesson to learn**

This is a very unusual and strange accident, but it did happen. It underlines that wearing good quality cloths and boots is definitely worth the money in case of an accident. Although the boots of this case look and feel as if they were robust and sturdy, they did not protect the foot as expected. Of course, boots cannot withstand all kinds of forces and at any level. But in this case the sole not only collapsed but also formed a dangerous shape that finally caused the most severe injury of the motorcycle rider. Without a detailed accident database available it is impossible to tell, whether this is a one-of-a-kind traffic accident or not. Therefore, it would be already quite helpful to make accident reports accessible to the public via Internet or any other method of communication. This could help to identify and find out about products that are dangerous rather than protective for their users.



Figure 9



Figure 10



Figure 11



Figure 12

## CONCLUSIONS

Analysis and reconstruction of accidents involving motorcycles have to be carried out in many cases and for several reasons. The results contain valuable information about mechanisms and causes of accidents. It would be desirable to make such reports available to the public and to motorcycle riders in particular. These reports could serve as teaching material for rider schools as well as for experienced bikers from which they can learn what errors others have made already, and what the consequences have been. Learning from the mistakes of others is cheaper, easier and less dangerous, compared to one's own bad experience.

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