

The Physics of a Crash

On Saturday afternoon, October 23, at around 2:30 PM, Rodney Racer drove his brand new Holloway Industries (HI) sports car, the XC-9 off a cliff when he lost control going around a corner. Rodney claims the car was defective. He states that he was well below the posted speed limit and that the car lost traction with the road and went off the cliff. Luckily, he survived the crash with only some broken bones. He is suing Holloway Industries for damages totaling 2.7 million dollars and is demanding that the inferior vehicle be recalled.

You have been subpoenaed by the court to give expert testimony based on your extensive physical science knowledge, particularly, your knowledge of physics and the laws of motion. You will be writing a report, which explains the physics involved in determining the speed of the car as it left the road.

Information obtained from the crime scene is as follows:

1. The car was going around a left hand corner.
2. The car was traveling 10° west of north when it lost control.
3. The crash occurred at approximate 2:40 pm.
4. The engine is capable of 340 horsepower.
5. The posted speed was 50 miles per hour.
6. The cliff was measured to be 58 ft high.
7. The corner was banked up at 3° from the inside of the turn to the outside.
8. The corner has radius of curvature of 75 m.
9. There was a guardrail that the car broke through with a restraining force of at least 1500 lbs.
10. The car landed 201 ft (horizontally) from where it broke through the guard rail.
11. The car weighs 2600 lbs.
12. The tire pressure was 36 PSI.
13. The weather was clear with no rain, but a five mile per hour wind from the south.
14. The acceleration due to gravity is 32 ft per second per second.
15. The XC-9 is front wheel drive with all wheel anti-lock brakes.
16. No skid marks were noticed at the scene.
17. The XC-9 was metallic midnight blue.

Your report should be address the following concerns:

1. An introduction about projectile motion and the important facts. Discuss which details provide hard answers and which details only can be looked at conceptually.
2. An explanation of how fast the car was going, including a section detailing the formulas used and the calculations you performed.
3. A conceptual interpretation of the effect of other forces that cannot be calculated exactly, such as the effect of wind and air resistance on the car and how that would affect your calculations, be specific and make sure you do not contradict yourself.
4. The effect of the guardrail on the car and how that would effect your calculations.

5. The conclusion should both restate and summarize your findings and clearly state how fast the car was traveling at the time of the accident.

Remember that the judge does not have a strong science background, so you need to thoroughly explain the concepts you are using to him in your report. This is scientific or technical writing. Be precise and use concrete nouns instead of pronouns to avoid confusion. Be concise, but thorough. There is no need for great transitions. In fact, many technical papers have section headings instead of a continuous flow to the paper. This paper definitely has a right answer. You need to find out what happen that fateful day.

Good luck and happy driving.