

SECOND EDITION

MOTOR VEHICLE
ACCIDENT
RECONSTRUCTION
AND
CAUSE ANALYSIS

RUDOLF LIMPERT

**MOTOR VEHICLE
ACCIDENT RECONSTRUCTION
AND CAUSE ANALYSIS**

SECOND EDITION

RUDOLF LIMPERT

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PREFACE TO SECOND EDITION

I thank all those who have made suggestions and corrections. In the second edition I have included a number of tire friction values for abnormal surfaces, a new chapter on car-pedestrian accidents, and a few more data on crash worthiness.

I hope that the second edition will continue to be a valuable tool in the hands of the accident reconstructionist.

Salt Lake City, Utah

R.L.

PREFACE TO FIRST EDITION

This book is written for lawyers, claims adjusters, highway safety engineers, and investigating officers, who are interested in motor vehicle accident reconstruction.

The problems of accident reconstruction and the accurate determination of causes of collisions and injuries become evident when the trial lawyer must present or defend his case, when the adjuster must make a recommendation to the insurance carrier, when the safety engineer must evaluate high frequency accident locations, or when the investigating officer must give a citation.

A equally important problem is associated with the specific nature of motor vehicle accident reconstruction, and the generally nonengineering background of lawyers and claims adjusters. For example, a law suit might rest entirely upon the determination of trailer braking accident causation. Although a well-qualified expert can easily establish the facts, the trial lawyer may not be sufficiently prepared to accurately formulate his case.

In my activities involving the investigation and reconstruction of hundreds of collisions, and testifying in court, I have learned that the capability of combining physical understanding and the description of physical concepts in simple engineering equations is essential for a successful court room demonstration.

In following this philosophy, I have written this book. The book presents a description of physical factors such as the functioning of various vehicle components and their safety-critical contribution, and a mathematical description of a variety of different aspects of accident reconstruction. Only when these equations are available can the trial lawyer ask penetrating questions in court.

The book is divided into eight parts. Part 1, concerned with motor vehicle factors, presents the functions and different design concepts of all essential vehicle components. Their critical performance in accidents is discussed. Part 2 deals with vehicle motion analysis. Presented are motion fundamentals, tire forces, braking, vibrations, and directional control including rollover and handling of vehicles. Part 3 treats accident avoidance analysis. Included in the discussions are if and how a collision can be avoided, passing maneuver and driver view field analysis. Part 4

PREFACE TO FIRST EDITION

deals with the fundamentals of collision analysis. Both nonrotating and rotating collision vehicles are considered. Impact analyses including rotation are essential for accident reconstructions involving primary and secondary collisions. Post crash motion, occupant dynamics, human tolerances to impact loading, and computer based collision reconstruction are discussed. Part 5, concerned with safety standards, presents a brief summary of existing Federal Safety Standards and ongoing defects investigations. Part 6 treats accident investigation factors and a discussion of their relative importance to accident reconstruction. Part 7 deals with the application of reconstruction fundamentals to actual collisions. The reader will find several cases covering all major aspects of reconstruction. Part 8 is concerned with special studies. Included are special accident studies and findings about accident statistics. A brief description of a desirable profile of an expert witness and court room hints are included.

I want to express many thanks to Paul Cook and the Michie Company for their professional work that made the publication of this book possible.

Last but not least, I must thank my wife and children, whose unwavering faith in their Dad made a twenty-hour day an enjoyable task.

Salt Lake City, Utah

R.L.

TABLE OF CONTENTS

	<i>Page</i>
<i>Preface to Second Edition</i>	xxi
<i>Preface to First Edition</i>	xxiii

CHAPTER 1. INTRODUCTION	1
§ 1-1. Objective of Accident Reconstruction	1
§ 1-2. Factors Influencing Accident Reconstruction ...	2
§ 1-3. Accident Reconstruction Overview	3

PART 1: MOTOR VEHICLE FACTORS

CHAPTER 2. THE CHASSIS	7
§ 2-1. The Functions of the Chassis	7
§ 2-2. Different Concepts Used in Chassis Design	7
§ 2-2.1. Engine Location	7
§ 2-2.2. Drive Axle Location	9
§ 2-2.3. Transmission Location	10
§ 2-2.4. Engine Type	11
§ 2-2.5. Chassis Maintenance	13
§ 2-2.6. Safety Considerations	14

CHAPTER 3. THE FRAME AND BODY	17
§ 3-1. The Functions of the Frame	17
§ 3-2. Different Concepts Used in Frame Design	17
§ 3-3. The Functions of the Body	22
§ 3-4. Different Concepts Used in Body Design	22
§ 3-5. Body Terminology	23
§ 3-6. Safety Considerations	27

CHAPTER 4. THE SUSPENSION SYSTEM	31
§ 4-1. The Function of the Suspension System	31
§ 4-2. Different Concepts Used in Suspension Designs	32
§ 4-2.1. Solid Axle	32
§ 4-2.2. De Dion Rear Suspension	36
§ 4-2.3. Swing Axle	36
§ 4-2.4. Trailing Arm Suspension	38

TABLE OF CONTENTS

	<i>Page</i>
§ 4-2.5. Semi-Trailing Arm Suspension	41
§ 4-2.6. Unequal-Arm Front Suspension	44
§ 4-2.7. McPherson Strut Suspension	44
§ 4-2.8. Tandem Axle Suspension	46
§ 4-3. Types of Springs	46
§ 4-3.1. Leaf Springs	46
§ 4-3.2. Coil Springs	47
§ 4-3.3. Torsion Bar	47
§ 4-3.4. Rubber Springs	48
§ 4-3.5. Air or Gas Spring	49
§ 4-3.6. Hydro-Gas Springs	52
§ 4-4. Types of Dampers	53
§ 4-4.1. Frictional Damper	53
§ 4-4.2. Hydraulic Lever Damper	54
§ 4-4.3. Hydraulic Shock Absorbers	55
§ 4-5. Auxiliary Suspension Systems	57
§ 4-6. Suspension Maintenance	57
§ 4-7. Safety Considerations	58
 CHAPTER 5. THE TIRE AND RIM	 59
§ 5-1. The Functions of Tire and Rim	59
§ 5-2. Different Concepts Used in Rim Design	59
§ 5-3. Different Concepts Used in Tire Design	60
§ 5-4. Tire Notation	63
§ 5-5. Special Safety Tire Designs	65
§ 5-6. Tire Retreads	65
§ 5-7. Wheel Balance	66
§ 5-8. Tire Wear	67
§ 5-8.1. Causes of Tire Wear	67
§ 5-8.2. Effects of Tire Wear	68
§ 5-9. Tire Maintenance	69
§ 5-10. Safety Considerations	69
 CHAPTER 6. THE STEERING SYSTEM	 71
§ 6.1. The Function of the Steering System	71
§ 6.2. Different Concepts Used in Steering System Designs	71
§ 6-2.1. Steering Linkage Geometry	72
§ 6-2.2. Wheel Position	76

TABLE OF CONTENTS

	<i>Page</i>
§ 6-2.3. Rear Wheel Steering	79
§ 6-2.4. Steering Gear System	80
§ 6-3. Steering System Maintenance	84
§ 6-4. Steering System Failure	84
§ 6-5. Steering Column Performance	85
CHAPTER 7. THE BRAKING SYSTEM	87
§ 7-1. The Function of the Braking System	87
§ 7-2. Different Concepts Used in Braking Systems ..	88
§ 7-2.1. Intended Braking Function	88
§ 7-2.2. Brake Force Production	89
§ 7-3. Brake System Components	108
§ 7-3.1. Standard Master Cylinder	108
§ 7-3.2. Tandem Master Cylinder	110
§ 7-3.3. Stepped Bore Master Cylinder	111
§ 7-3.4. Special Stepped Bore Tandem Master Cylinder	111
§ 7-3.5. Wheel Cylinder	111
§ 7-3.6. Brake Chamber	112
§ 7-3.7. Brake Shoe Configuration	112
§ 7-3.8. "S" Cam Brake	113
§ 7-3.9. Wedge Brake	114
§ 7-3.10. Brake Shoe Adjustment	114
§ 7-3.11. Disc Brake	115
§ 7-3.12. Parking Brake	116
§ 7-3.13. Hydraulic Brake Line	116
§ 7-3.14. Pressure Regulating Valves	117
§ 7-4. Wheel Antilock Brake System	119
§ 7-4.1. Fundamental Considerations	119
§ 7-4.2. Hydraulic Systems	120
§ 7-4.3. Pneumatic Systems	127
§ 7-5. Brake Fluids	130
§ 7-6. Brake System Maintenance	131
§ 7-7. Safety Considerations	131
CHAPTER 8. THE ENGINE	133
§ 8-1. The Function of the Engine	133
§ 8-2. Different Concepts Used in Engine Designs ...	133
§ 8-2.1. Power Development	133

TABLE OF CONTENTS

	<i>Page</i>
§ 8-2.2. Engine Cycle	135
§ 8-2.3. Valve Design and Control	136
§ 8-2.4. Fuel-Air Mixing	136
§ 8-2.5. Type of Ignition	138
§ 8-2.6. Compression Level	138
§ 8-2.7. Cylinder Arrangement	138
§ 8-2.8. Cooling System	139
§ 8-2.9. Engine Components	140
§ 8-2.10. Engine Maintenance	141
§ 8-2.11. Engine Failure	141
CHAPTER 9. THE CLUTCH	143
§ 9-1. The Function of the Clutch	143
§ 9-2. Different Concepts Used in Clutch Design	143
§ 9-2.1. Torque Transmission	143
§ 9-2.2. Types of Friction Clutches	145
§ 9-2.3. Type of Plate Pressuring	145
§ 9-2.4. Clutch Actuation	146
§ 9-3. Clutch Failure	147
CHAPTER 10. THE TRANSMISSION	149
§ 10-1. The Function of the Transmission	149
§ 10-2. Different Concepts Used in Transmission Design	149
§ 10-2.1. Manual Transmission	149
§ 10-2.2. Semi-Automatic Transmission	150
§ 10-2.3. Automatic Transmission	151
§ 10-3. Gear Shift Lever Location	152
§ 10-3.1. Direct Shifting	152
§ 10-3.2. Indirect Shifting	152
§ 10-4. Transmission Failure	153
CHAPTER 11. THE DRIVE SHAFT	155
§ 11-1. The Function of the Drive Shaft	155
§ 11-2. Different Concepts Used in Drive Shaft Design	155
§ 11-2.1. Drive Shaft Arrangement	155
§ 11-2.2. Coupling System	156
CHAPTER 12. THE FINAL DRIVE	157
§ 12-1. The Function of the Final Drive	157

TABLE OF CONTENTS

	<i>Page</i>
§ 12-2. Drive System	157
§ 12-3. Final Drive Reduction	157
CHAPTER 13. THE DIFFERENTIAL	159
§ 13-1. The Function of the Differential	159
§ 13-2. Different Concepts Used in Differential Designs	159
§ 13-2.1. Standard Differential	159
§ 13-2.2. Limited Slip Differential	160
§ 13-2.3. Locking Differential	161
CHAPTER 14. THE DRIVE AXLE	163
§ 14-1. The Function of the Drive Axle	163
§ 14-2. Different Concepts Used in Drive Axle Design	163
§ 14-2.1. Solid Drive Axle	163
§ 14-2.2. Divided Drive Axle	163
§ 14-2.3. Tandem Drive Axle	164
§ 14-3. Drive Axle Failure	164
CHAPTER 15. THE ELECTRICAL SYSTEM	165
§ 15-1. The Functions of the Electrical System	165
§ 15-2. Components of the Electrical System	165
§ 15-2.1. The Battery	165
§ 15-2.2. The Generator	166
§ 15-2.3. The Alternator	166
§ 15-2.4. The Starter Motor	166
§ 15-2.5. The Lighting System	167
§ 15-2.6. The Fuse	167
§ 15-2.7. The Engine Ignition System	167
§ 15-3. Electrical System Failure	168
PART 2: VEHICLE MOTION ANALYSIS	
CHAPTER 16. FUNDAMENTALS OF MOTION ANALYSIS	171
§ 16-1. Definition of Motion	171
§ 16-2. Straight Line Motion	171
§ 16-2.1. Measures of Straight Line Motion ..	171
§ 16-2.2. The Velocity-Time Diagram	173
§ 16-3. Circular Motion (Rotation)	183
§ 16-3.1. Angular Velocity	184

TABLE OF CONTENTS

	<i>Page</i>
§ 16-3.2. Angular Acceleration	184
§ 16-3.3. Angular Velocity and Circumferential Velocity	185
§ 16-3.4. Angular Acceleration and Tangential Acceleration	185
§ 16-3.5. Centrifugal Acceleration	185
§ 16-3.6. Angular Velocity-Time Diagram ...	186
§ 16-4. Free Flight Motion	189
CHAPTER 17. FUNDAMENTALS OF FORCE ANALYSIS	191
§ 17-1. Definition of Force	191
§ 17-2. Definition of Mass	191
§ 17-3. Relationship Between Mass and Force	192
§ 17-4. Force and Mass in Rotation	193
§ 17-5. The Friction Force	194
§ 17-6. Mechanical Energy	195
CHAPTER 18. THE TIRE FORCE	199
§ 18-1. Fundamental Considerations	199
§ 18-2. Forces Acting on a Standing Tire	200
§ 18-3. Forces Acting on a Rolling Tire	201
§ 18-4. Forces Acting on a Braked or Driven Tire ...	205
§ 18-5. Forces Acting on a Cornering Tire	212
§ 18-6. Factors Influencing Tire Friction	223
§ 18-6.1. Dry Road Surfaces	223
§ 18-6.2. Wet Road Surfaces	223
CHAPTER 19. CONSTANT SPEED AND ACCELERA- TION ANALYSIS OF VEHICLES	227
§ 19-1. Equation of Motion	227
§ 19-2. Resistance Forces to Vehicle Motion	228
§ 19-2.1. Rolling Resistance	228
§ 19-2.2. Toe-In Resistance	228
§ 19-2.3. Rough-Road Resistance	228
§ 19-2.4. Turning Resistance	229
§ 19-2.5. Aerodynamic Resistance	230
§ 19-2.6. Engine Drag Resistance	231
§ 19-2.7. Inclined Road Force	231
§ 19-2.8. Acceleration Resistance	232

TABLE OF CONTENTS

	<i>Page</i>
§ 19-3. Engine and Torque Converter Characteristics	233
§ 19-4. Maximum Speed Prediction	235
§ 19-5. Maximum Slope Prediction	237
§ 19-6. Maximum Acceleration Prediction	239
§ 19-7. Four-Wheel Drive Analysis	241
§ 19-8. Prediction of Fuel Consumption	241
CHAPTER 20. VEHICLE BRAKING ANALYSIS	243
§ 20-1. Brake Torque and Brake Force	244
§ 20-2. Braking Deceleration	248
§ 20-3. Prediction of Stopping Distance	249
§ 20-4. Minimum Wheels Unlocked Stopping Distance	255
§ 20-5. Deceleration Analysis of Nonregular Cases ...	261
§ 20-6. Stability During Braking	263
§ 20-7. Braking in a Turn	265
§ 20-8. Braking of Combination Vehicles	267
§ 20-9. Brake Failure Analysis	270
§ 20-9.1. Development of Brake Failure	271
§ 20-9.2. Brake Failure Analysis	276
§ 20-9.3. Brake Assembly Failure Due to Exces- sive Temperature	285
§ 20-9.4. Consequences of Brake Failure	286
§ 20-9.5. Brake System Component Deteriora- tion	289
§ 20-9.6. Human Factor Considerations	291
§ 20-9.7. Effects of Maintenance on Brake Fail- ure	292
§ 20-10. Motorcycle Braking	294
CHAPTER 21. VEHICLE VIBRATIONS	295
§ 21-1. Effect of Vehicle Vibrations on Highway Safety	295
§ 21-2. Causes of Vibrations	296
§ 21-3. Effect of Vehicle Weight	297
§ 21-4. Effect of Suspension Stiffness	298
§ 21-5. Effect of Suspension Damping (Shock Absorber)	299
§ 21-6. Effect of Unsprung Mass of Wheel and Suspen- sion	299
§ 21-7. Effect of Tire Characteristics	300

TABLE OF CONTENTS

	<i>Page</i>
§ 21-8. Effect of Front and Rear Suspension Tuning ..	301
CHAPTER 22. VEHICLE DIRECTIONAL CONTROL ...	303
§ 22-1. Lateral Acceleration	303
§ 22-2. Vehicle Turning	304
§ 22-2.1. Turning Radius at Low Speeds	305
§ 22-2.2. Steady-State Turning (Constant Forward Velocity)	307
§ 22-2.3. Vehicle Rollover	327
§ 22-2.4. Steering Wheel Moment	336
§ 22-2.5. Steering Wheel Rotation	338
§ 22-2.6. Vehicle Steering Coefficient	339
§ 22-2.7. Turning of a Car-Trailer Combination	340
§ 22-3. Vehicle Control	341
§ 22-3.1. Vehicle Handling	341
§ 22-3.2. Straight Line Running Stability ...	343
§ 22-3.3. Transient Response of a Two-Axle Vehicle to a Steering Input	344
§ 22-3.4. Transient Response of a Car-Trailer Combination to a Steering Input ...	348
§ 22-4. Tractor or Semitrailer Rollover Analysis	351
§ 22-4.1. Fixed Load Rollover	352
§ 22-4.2. Swinging Load Rollover	355
§ 22-5. Motorcycle Stability	357
PART 3: ACCIDENT AVOIDANCE ANALYSIS	
CHAPTER 23. ACCIDENT AVOIDANCE CONCEPTS ..	361
CHAPTER 24. ALCOHOL EFFECTS ON HUMAN RESPONSE TIME	365
CHAPTER 25. PREDICTION OF ACCIDENT AVOIDANCE CAPACITY	371
§ 25-1. Straight-Line Braking Maneuver	372
§ 25-2. Lane Changing — Straight Path Initially ...	373
§ 25-3. Turning Maneuver — Straight Path Initially	376
§ 25-4. Braking or Steering to Avoid a Collision	378
§ 25-5. Braking and Lane Changing — Straight Path Initially	380

TABLE OF CONTENTS

	<i>Page</i>
§ 25-6. Braking and Turning — Straight Path Initially	382
§ 25-7. Braking in a Turn	382
§ 25-8. Motorcycle Steering	382
§ 25-9. Safety Distance	383
CHAPTER 26. PASSING MANEUVER	385
§ 26-1. Constant Velocity Passing	385
§ 26-2. Passing With Acceleration	386
CHAPTER 27. DRIVER VIEW FIELD ANALYSIS	391
§ 27-1. Constant Velocity Case	391
§ 27-2. Decreasing Velocity Case	393
PART 4: COLLISION ANALYSIS	
CHAPTER 28. IMPACT ANALYSIS	401
§ 28-1. Impact Fundamentals	401
§ 28-2. Straight Central Impact	402
§ 28-3. Oblique Central and Straight Non-Central Im- pact	406
§ 28-4. Oblique Non-Central Impact	406
§ 28-5. Determination of Impact Speeds From Damage Dimensions	414
§ 28-5.1. Elastic Deformation	415
§ 28-5.2. Elastic/Plastic Deformation	417
CHAPTER 29. POST CRASH MOTION ANALYSIS	423
§ 29-1. Straight Line Vehicle Travel Without Rotation	423
§ 29-1.1. Skidding After Impact	423
§ 29-1.2. Braking Without Skidding After Im- pact	424
§ 29-2. Vehicle Skidding With Rotation	424
§ 29-3. Wheels Unlocked Motion	431
CHAPTER 30. COLLISION ANALYSIS BY COMPUTER	433
§ 30-1. Simulation Model of Automobile Collision (SMAC)	433
§ 30-1.1. Vehicle Model Description	433
§ 30-1.2. Computer Analysis Accuracy	434

TABLE OF CONTENTS

	<i>Page</i>
CHAPTER 31. OCCUPANT DYNAMICS	437
§ 31-1. The Unrestrained Occupant	437
§ 31-1.1. Occupant Kinematics	437
§ 31-1.2. Forces Sustained by the Occupant ..	438
§ 31-2. The Restrained Occupant	439
CHAPTER 22. HUMAN TOLERANCE TO IMPACT	
LOADING	443
§ 32-1. Basic Considerations	443
§ 32-2. Human Tolerance Levels	444
§ 32-3. Fire Injury Severity	446
CHAPTER 33. CAR-PEDESTRIAN ACCIDENTS	447

PART 5: GOVERNMENT HIGHWAY SAFETY STANDARDS

CHAPTER 34. FEDERAL MOTOR VEHICLE SAFETY	
STANDARDS	457
§ 34-1. Standards for Crash Avoidance	459
§ 34-1.1. Std. 101 — Control Location, Identification, and Illumination	459
§ 34-1.2. Std. 102 — Transmission Shift Lever Sequence, Starter Interlock, and Transmission Braking Effect	460
§ 34-1.3. Std. 103 — Windshield Defrosting and Defogging Systems	460
§ 34-1.4. Std. 104 — Windshield Wiping and Washing Systems	460
§ 34-1.5. Std. 105 — Hydraulic Brake System	460
§ 34-1.6. Std. 106 — Hydraulic Brake Hoses	461
§ 34-1.7. Std. 107 — Reflecting Surfaces	461
§ 34-1.8. Std. 108 — Lamps, Reflective Devices, and Associated Equipment ..	461
§ 34-1.9. Std. 109 — New Pneumatic Tires ..	462
§ 34-1.10. Std. 110 — Tire Selection and Rims	462
§ 34-1.11. Std. 111 — Rear View Mirrors	462
§ 34-1.12. Std. 112 — Headlamp Concealment Devices	462
§ 34-1.13. Std. 113 — Hood Latch Systems ...	463

TABLE OF CONTENTS

	<i>Page</i>
§ 34-1.14. Std. 114 — Theft Protection	463
§ 34-1.15. Std. 115 — Vehicle Identification Numbers	463
§ 34-1.16. Std. 116 — Hydraulic Brake Fluids	463
§ 34-1.17. Std. 117 — Retreaded Pneumatic Tires	464
§ 34-1.18. Std. 118 — Power-Operated Window Systems	464
§ 34-1.19. Std. 119 — Tires for Vehicles Other Than Passenger Cars	464
§ 34-1.20. Std. 120 — Tire Selection and Rims for Motor Vehicles Other Than Pas- senger Cars	464
§ 34-1.21. Std. 121 — Air Brake Systems	464
§ 34-1.22. Std. 122 — Motorcycle Brake Sys- tems	465
§ 34-1.23. Std. 123 — Motorcycle Controls and Displays	465
§ 34-1.24. Std. 124 — Accelerator Control Sys- tems	465
§ 34-1.25. Std. 125 — Warning Devices	466
§ 34-1.26. Std. 126 — Truck-Camper Loading	466
§ 34-1.27. Std. 127 — Speedometers and Odo- meters	466
§ 34-2. Standards for Injury Reduction	466
§ 34-2.1. Std. 201 — Occupant Protection in Interior Impact	466
§ 34-2.2. Std. 202 — Head Restraints	467
§ 34-2.3. Std. 203 — Impact Protection for the Driver From the Steering Control System	467
§ 34-2.4. Std. 204 — Steering Control Rear- ward Displacement	467
§ 34-2.5. Std. 205 — Glazing Materials on Pas- senger Cars, Multipurpose Vehicles, Motorcycles, Trucks, and Buses ...	468