

Summary of Motorcycle Friction Tests

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Introduction

The following is a list of sources for coefficient of friction values for use when a motorcycle slides during a collision sequence. Most of the values contained within are for standard motorcycles, where there are a variety of protrusions that tend to interact with the roadway surface to gouge or scrape while the motorcycle is sliding. There is only limited test information available at this time for sport motorcycles, which tend to slide more easily across the roadway due to the sleek bodywork that prevents the deep gouging seen on other bikes.

Application of any particular coefficient of friction in a real-world collision should be done with consideration for the manner in which motorcycle traveled across the roadway surface and the degree of scraping or gouging that occurred during the slide. In general, the greater the degree of roadway gouging and scraping, the higher one would expect to be the coefficient of friction. It is suggested that a range of coefficient of friction be used for each set of calculations performed, increasing the probability that an accurate estimate of energy loss is calculated.

Source Materials

Collins, James, C. *Accident Reconstruction*, Springfield, Illinois: Charles C. Thomas, Publisher, 1979.

The author suggests sliding friction coefficient of .55 to .7 for motorcycles not equipped with crash bars. Collins indicates that a value of .5 or less for motorcycles with crash bars or fairing might be appropriate. There are no references to drop tests or other treatises.

Warner, Charles Y., Smith, Gregory C., James, Michael B. and Germane, Geoff J. "Friction Applications in Accident Reconstruction," *SAE 830612*, (1983): 1- 11.

The author suggests using .55 to .70 for a sliding motorcycle, relying upon Collins. No other test data relied upon for these suggestions.

Searle, John A. and Searle, Angela. "The Trajectories of Pedestrians, Motorcycles, Motorcyclists, etc., Following a Road Accident," SAE 831622, (1983): 277-285.

The primary subject of this paper is pedestrian/cyclist throw trajectories. A table contained within the paper indicates "*several typical coefficients have been measured.*" Author indicates a range of .35 to .50 for a motorcycle sliding on dry asphalt and .30 to .40 on wet asphalt. No references to test data or other treatises on motorcycle drag factors.

Shumborski, W.A., et al. "Royal Canadian Mounted Police Motorcycle Drag Factor Tests," Port Coquitlam, B.C.: Royal Canadian Mounted Police Coquitlam Detachment, unpublished report, 1984.

In September of 1984, the RCMP in British Columbia performed a series of drag tests with six different motorcycles. The results of the tests were provided to the members of the IAARS and CATAIR through correspondence. The drag tests were performed by towing the motorcycles behind a tow truck at "*slow*" and "*fast*" rates. The slow tests were accomplished by using the hydraulic winch on the truck, while the fast tests were performed with the tow truck moving. After the drag tests were performed, the motorcycle used in the "A" tests was dropped from a vehicle moving at 57 kilometers per hour. The authors suggest that the drag tests correlate well with the dynamic tests, although the dynamic test resulted in a drag factor lower than most of the quasi-static tests.

Test No.	Motorcycle	Weight (lbs)	Ave. Pull	Ave. f	Speed	Notes
A1	1973 Yamaha 300cc	410	293.3	0.71	Slow	Pulled seat/tank first
A2	1973 Yamaha 300cc	410	255.0	0.62	Fast	Pulled seat/tank first
A3	1973 Yamaha 300cc	410	295.0	0.71	Slow	Pulled by front tire
A4	1973 Yamaha 300cc	410	287.5	0.70	Fast	Pulled by front tire
B1	1975 Honda 360cc	370	254.0	0.68	Slow	Tank first

Test No.	Motorcycle	Weight (lbs)	Ave. Pull	Ave. f	Speed	Notes
B2	1975 Honda 360cc	370	233.0	0.62	Slow	Bottom first
B3	1975 Honda 360cc	370	252.5	0.68	Fast	Bottom first
B4	1975 Honda 360cc	370	275.0	0.74	Slow	by front forks
B5	1975 Honda 360cc	370	-	-	Fast	Bounced badly
B6	1975 Honda 360cc	370	240.0	0.64	Fast	Bounced badly but 1 reading
C1	Honda 50	155	93.3	0.60	Slow	Seat first
C2	Honda 50	155	65.0	0.48	Fast	Seat first
D1	Kawasaki 750cc	470	318.0	0.67	Slow	Tank first
D2	Kawasaki 750cc	470	363.3	0.77	Fast	Tank first
D3	Kawasaki 750cc	470	335.0	0.71	Slow	Bottom first
D4	Kawasaki 750cc	470	350.0	0.74	Fast	Bottom first
D5	Kawasaki 750cc	470	310.0	0.65	Slow	By back tire
D6	Kawasaki 750cc	470	272.5	0.57	Fast	Towed by rear tire
E1	Small dirt bike	117	66.4	0.56	By hand	No seat, handlebars, tank or cylinder head
E2	Small dirt bike	117	67.2	0.57	By hand	No seat, handlebars, tank or cylinder head
F1	Honda 750cc	450	284.0	0.63	Slow	Burned
F2	Honda 750cc	450	300.0	0.66	Towed	Bouncing
F3	Honda 750cc	450	303.3	0.67	Towed	Rolled on to top
F4	Honda 750cc	450	297.5	0.66	Towed	Towed by front tire
G	1973 Yamaha 300cc	410		0.61	57 kph	Overall slide distance 20.9 meters

Lynch, George F. "Conducting Test Slides: Motorcycles on Asphalt," *Law and Order*, (November 1984): 11-12.

This article describes tests performed by the Omaha, NE Police Department using two 1970's vintage Honda 350cc motorcycles. The motorcycles were dropped in two distinct methods onto the roadway. The first method was intended to simulate a "*High-side flip*" and was simply a motorcycle dropped sideways from a towed trailer. The second methodology involved rolling the motorcycle up to speed, then pushing the handlebars to one side to cause the bike to go down onto the pavement. The article includes specific data from four individual tests, but refers to other tests performed where the data was not itemized. When the test data was adjusted for roadway grade, they found friction ranging from .38 to .55 g's. A set of tests was also done on wet roadways, with no difference in drag factor noted.

Test	Motorcycle	Speed	f	Delta V	f Adjusted
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Test	Motorcycle	Speed	f	Delta V	f Adjusted
1	350 Honda Street	30 mph	0.40	79' 2"	0.50
2	350 Honda Street	32 mph	0.55	61' 1"	0.65
1	350 Honda	31 mph	0.28	114'	0.38
1	350 Honda Enduro	31 mph	0.28	111' 7"	0.38
Note: Other tests done but individual data not reported					

Day, Terry D. and Smith, Jay R. "Friction Factors for Motorcycles Sliding on Various Surfaces," SAE 840250, (1984): 1-7.

The authors tested two motorcycles on various surfaces in both quasi-static and dynamic drag tests. Tests were performed at 40 kilometers per hour and at less than 1 kilometer per hour. No conclusions could be reached on whether there was a general difference between the dynamic test results and the quasi-static test results, as the results were mixed in this small sample of tests.

Test No.	Condition	Average Drag Factor					
		Asphalt		Gravel		Sodded Earth	
		km/h		km/h		km/h	
		0.00	40.00	0.00	40.00	0.00	32.00
1a	Honda, right side	0.59	0.45	--	0.79	---	---
1b	Honda, left side	0.58	0.54	--	0.68	---	---
1c	Honda, right side	0.51	0.54	0.64		---	---
1d	Honda, right side	--	--	--	--	0.90	0.70
2a	Yamaha, right side	0.42	0.49	--	--	---	---
2b	Yamaha, right side	0.66	0.58	0.69	0.74	---	---

"Motorcycle Drag Factor Tests," Southwestern Association of Technical Accident Investigators, unpublished report, 1984.

Tests were conducted by dropping a motorcycle from a moving truck from height of 6 inches from the pavement. The speed of the truck versus the overall slide distance produced average drag factors. (Incomplete data)

Speed (mi/hr)	Distance (feet)	Drag Factor	Comments
40	88	0.61	Right side sliding

40	86	0.62	Right side, some gouging and scratching
49	158	0.51	Right side, scratching
48	178	0.43	Right side, sliding and scratching
65	284	0.50	Left side, sliding, scratching and tire scuff
50	164	0.51	Right side, sliding
50	134	0.62	Left side, sliding, some gouging, scratching
51	173	0.50	Left side, sliding, scratching, some bouncing
38	69	0.70	Flipped three times

“Motorcycle Test Skidding on its Side,” Iowa State Patrol Traffic Investigation Spring Seminar, unpublished report, 1985.

Two motorcycles, a 1980 Can Am 400 Qualifier and a 1974 Yamaha Enduro 175, were dropped six times each onto the pavement at known speeds. The reported information is included in the following tables. (Incomplete data)

Speed mph	Surface	Motorcycle	Drag Factor
37	Portland Cement	Can AM	0.45
39	Portland Cement	Can AM	0.60
39	Asphalt	Can AM	0.56
38	Asphalt	Can AM	0.62
38	Gravel	Can AM	0.88
40	Gravel	Can AM	0.78
38	Portland Cement	Yamaha	0.64
38	Portland Cement	Yamaha	0.61
39	Asphalt	Yamaha	0.71
38	Asphalt	Yamaha	0.68
41	Gravel	Yamaha	0.92
40	Gravel	Yamaha	1.07

Daily, John. *Fundamentals of Traffic Accident Reconstruction*, Institute of Police Technology and Management, University of North Florida, 1988.

The author has a chapter devoted to motorcycle accident reconstruction. Daily refers to *“Tests conducted by IPTM of the past several years”* in suggesting the following drag factors for motorcycles under various conditions.

Drag factors if motorcycle falls to pavement (no large projections):

a. Standard Street, light pavement scratching	$f' = .30 - .35$
b. Crash bars	$f' = .2$
c. Fluids from motorcycle lubricating surface	$f' = .2$
d. Significant pavement scratches, 1/4 inch deep	$f' = .5 - .6$
Drag factors of motorcycles on soil:	
a. Soft soil, sand	$f' = .9 - 1.2$
b. Harder soil	$f' = .7$

Fries, Thomas R., Smith, Jay R. and Cronath, Keith M. "Stopping Characteristics for Motorcycles in Accident Situations," SAE 890734, (1989): 107-113.

This paper talks about "*a delay in implementing the deceleration.*" Apparently, the authors are referring to the average deceleration that takes place over the distance from where the motorcycle starts to go down to the end of the slide. They use an arbitrary time of .5 seconds to "adjust" the data from SAE 840250 as an example in the paper. No other independent tests were performed for this paper.

Lambourn, R.F. and Ashton, "Some Aspects of Two Wheeled Vehicle Accident Reconstruction," National Police Accident Investigation Seminar, March 1989.

This paper introduces the results of several series of drag tests performed by police with a number of motorcycles. The methods ranged from low speed drag tests to drop tests at speeds up to 59 miles per hour.

Test No.	Test Vehicle	Test Type	Test Speed	Stopping Distance	Average Deceleration
1	Honda 125R	Slide on offside	59 mph	129.3 m	0.27g
2	Honda 125R	Slide on nearside	59 mph	124.4 m	0.28g
A.	Honda 125R	Drag on nearside	Walking pace		0.34g
3	Honda 125R	Slide on nearside	40 mph	50.6 m	0.32g
4	Honda CB750G	Slide on offside	39 mph	43.7 m	0.35g
B.	Honda CB750G	Drag on offside	Walking pace		0.23 - 0.28g
C.	Honda CB750G	Drag on offside	Walking pace		0.33g
5	Honda CB750G	Slide on offside	31 mph	32.0 m	0.31g
D.	Honda CB750G	Drag on offside	Walking pace		0.44g
E.	Honda CB750G	Drag on offside	Walking pace		0.33g
6	Honda CB750G	Slide on offside	49 mph	95.5 m	0.26g
F.	Honda CB750G	Drag on offside	Walking pace		0.32 - 0.34g

7	Honda CB750G	Slide on offside	20 mph	Aborted Test	
8	Honda CB750G	Slide on offside	21 mph	17.5 m	0.26g
G.	Honda CB750G	Drag on offside	Walking pace		0.31 - 0.32g
9	Honda CB750G	Slide on offside	38 mph	58.8 m	0.25g
10	Honda CB750G	Slide on nearside	37 mph	56.3 m	0.25g
H.	Honda CB750G	Drag on nearside	Walking pace		0.25 - 0.27g
11	Honda CB750G	Slide on nearside	42 mph	62.0 m	0.29g
12	Honda CB750G	Slide on nearside	32 mph	34.5 m	0.30g
I.	Honda CB750G	Drag on nearside	Walking pace		0.32 - 0.34g
13	Honda CB750G	Slide on nearside	50 mph	99.3 m	0.26g
14	Honda CB750G	Slide on nearside	22 mph	13.4 m	0.37g
J.	Honda CB750G	Drag on nearside	Walking pace		0.42 - 0.44g

Test No.	Test Vehicle	Test Type	Test Speed	Stopping Distance	Average Deceleration
1	Honda C90	Slide on nearside	29 mph	13.1 m	0.65g
A.	Honda C90	Drag on nearside	Brisk walk		0.66g
2	Honda C90	Slide on nearside	40 mph	29.7 m	0.54g
3	Honda C90	Slide on nearside	49 mph	47.4 m	0.52g
B.	Honda C90	Drag on nearside	Brisk walk		0.54g
4	Honda C90	Slide on nearside	50 mph	58.0 m	0.44g
5	Honda C90	Slide on nearside	41 mph	47.5 m	0.36g
6	Honda C90	Slide on nearside	29 mph	21.5 m	0.38g
7	Honda C90	Slide on nearside	23 mph	13.1 m	0.41g
C.	Honda C90	Drag on nearside	Brisk walk		0.54g
8	Honda C90	Slide on offside	40 mph	28.8 m	0.57g
D.	Honda C90	Drag on offside	Brisk walk		0.54g
9	Honda C90	Slide on offside	49 mph	44.3 m	0.54g
10	Honda C90	Slide on offside	40 mph	30.4 m	0.54g
11	Honda C90	Slide on offside	30 mph	18.8 m	0.49g
12	Honda C90	Slide on offside	40 mph	30.3 m	0.54g
13	Honda CX500	Slide on offside	41 mph	31.6 m	0.54g
E.	Honda CX500	Drag on offside	Brisk walk		0.57g
14	Honda CX500	Slide on offside	45 mph	Aborted Test	
15	Honda CX500	Slide on offside	29 mph	17.7 m	0.48g
16	Honda CX500	Slide on offside	50 mph	63.5 m	0.40g
F.	Honda CX500	Drag on offside	Brisk walk		0.44g
17	Honda CX500	Slide on offside	40 mph	Aborted Test	
18	Honda CX500	Slide on offside	40 mph	44.1 m	0.37g
19	Honda CX500	Slide on offside	29 mph	22.8 m	0.38g
20	Honda CX500	Slide on nearside	41 mph	40.9 m	0.41g
21	Honda CX500	Slide on nearside	49 mph	73.0 m	0.33g
22	Honda CX500	Slide on nearside	45 mph	53.0 m	0.39g
23	Honda CX500	Slide on nearside	30 mph	20.5 m	0.45g

Fricke, Lynn B. Traffic Accident Reconstruction, Evanston, Illinois: Northwestern University Traffic Institute, 1990.

The section dealing with motorcycle accident investigation contains drag factor ranges for motorcycles sliding on their sides. These suggested ranges are based upon tests performed by the Traffic Institute, SATAI, RCMP, and Iowa State Patrol. Although there is a reference to tests performed at the Traffic Institute, the individual test results are not included in this publication. The reported values for Asphalt or Concrete surfaces range from **.40 to .75**. The range for gravel surfaces is **.65 to 1.05**.

Lambourn, Richard F. "The Calculation of Motorcycle Speeds from Sliding Distances," SAE 910125, (1991): 77-90.

This paper discusses previous test results from several sources and presents the results of seven motorcycles repeatedly tested in different manners. There were two general test methods. In the first method, the motorcycles were dropped from a low platform moving trailer at known speeds. The second method involved towing the motorcycles in an upright position with the front wheel in a carrier, where it was released and forced to the ground.

Test No.	Test Vehicle	Test Type	Test Speed	Stopping Distance	Average Deceleration
1	Honda CB750G - right side	Slide	63 km/h	43.7 m	.35g
2	Honda CB750G - right side	Drag	-10 km/h		.26g
3	Honda CB750G - right side	Drag	-10 km/h		.33g
4	Honda CB750G - right side	Slide	50 km/h	32 m	.31g
5	Honda CB750G - right side	Drag	-10 km/h		.33g
6	Honda CB750G - right side	Slide	79 km/h	95.5 m	.26g
7	Honda CB750G - right side	Drag	-10 km/h		.33g

Test No.	Test Vehicle	Test Type	Test Speed	Stopping Distance	Average Deceleration
8	Honda CB750G - right side	Slide	34 km/h	17.5 m	.26g
9	Honda CB750G - right side	Drag	-10 km/h		.31g
10	Honda CB750G - right side	Slide	61 km/h	58.8 m	.25g
11	Honda CB750G - left side	Slide	60 km/h	56.3 m	.25g
12	Honda CB750G - left side	Drag	-10 km/h		.25g
13	Honda CB750G - left side	Slide	68 km/h	62 m	.29g
14	Honda CB750G - left side	Slide	51 km/h	34.5 m	.30g
15	Honda CB750G - left side	Drag	-10 km/h		.33g
16	Honda CB750G - left side	Slide	80 km/h	99.3 m	.26g

Test No.	Test Vehicle	Test Type	Test Speed	Stopping Distance	Average Deceleration
1	Honda CX500 - right side	Slide	66 km/h	31.6 m	.54g
2	Honda CX500 - right side	Drag	-10 km/h		.57g
3	Honda CX500 - right side	Slide	46 km/h	33.8 m	.48g
4	Honda CX500 - right side	Slide	80 km/h	63.5 m	.40g
5	Honda CX500 - right side	Drag	-10 km/h		.44g
6	Honda CX500 - right side	Slide	64 km/h	44.1 m	.37g
7	Honda CX500 - right side	Slide	47 km/h	22.8 m	.38g
8	Honda CX500 - left side	Slide	65 km/h	40.9 m	.41g
9	Honda CX500 - left side	Slide	78 km/h	73.0 m	.33g

10	Honda CX500 - left side	Slide	72 km/h	53.0 m	.39g
11	Honda CX500 - left side	Slide	48 km/h	20.5 m	.45g

Test No.	Test Vehicle	Test Type	Test Speed	Stopping Distance	Average Deceleration
1	Honda C-90 - left side	Slide	47 km/h	13.1 m	.65g
2	Honda C-90 - left side	Drag	-10 km/h		.66g
3	Honda C-90 - left side	Slide	64 km/h	29.7 m	.54g
4	Honda C-90 - left side	Slide	79 km/h	47.4 m	.52g
5	Honda C-90 - left side	Drag	-10 km/h		.54g
6	Honda C-90 - left side	Slide	80 km/h	58.0 m	.44g
7	Honda C-90 - left side	Slide	66 km/h	47.5 m	.36g
8	Honda C-90 - left side	Slide	47 km/h	21.5 m	.38g
9	Honda C-90 - left side	Slide	37 km/h	13.1 m	.41g
10	Honda C-90 - left side	Drag	-10 km/h		.54g
11	Honda C-90 - right side	Slide	64 km/h	28.8 m	.57g
12	Honda C-90 - right side	Drag	-10 km/h		.54g
13	Honda C-90 - right side	Slide	79 km/h	44.3 m	.54g
14	Honda C-90 - right side	Slide	64 km/h	30.4 m	.54g
15	Honda C-90 - right side	Slide	48 km/h	18.8 m	.49g
16	Honda C-90 - right side	Slide	64 km/h	30.3 m	.54g

Test No.	Test Vehicle	Test Type	Test Speed	Stopping Distance	Average Deceleration
1	Honda CG125 - right side (leg shields)	Slide	75 km/h	67.4 m	.33g
2	Honda CG125 - right side (leg shields)	Drag	-10 km/h		.36g

Test No.	Test Vehicle	Test Type	Test Speed	Stopping Distance	Average Deceleration
3	Honda CG125 – right side (leg shields)	Slide	92 km/h	102.9 m	.32g
4	Honda CG125 – right side (leg shields)	Drag	-10 km/h		.35g
5	Honda CG125 – right side (leg shields)	Slide	41 km/h	15.6 m	.42g
6	Honda CG125 – right side (leg shields)	Drag	-10 km/h		.35g
7	Honda CG125 – right side (leg shields)	Slide	55 km/h	34.0 m	.35g
8	Honda CG125 – right side (leg shields)	Drag	-10 km/h		.36g
9	Honda CG125 – left side (no leg shields)	Slide	76 km/h	68.1 m	.33g
10	Honda CG125 – left side (no leg shields)	Drag	-10 km/h		.37g
11	Honda CG125 – left side (no leg shields)	Slide	91 km/h	97.0 m	.34g
12	Honda CG125 – left side (no leg shields)	Drag	-10 km/h		.35g
13	Honda CG125 – left side (no leg shields)	Slide	41 km/h	15.7 m	.42g
14	Honda CG125 – left side (no leg shields)	Slide	54 km/h	30.2 m	.38g
15	Honda CG125 – left side (no leg shields)	Drag	-10 km/h		.32g

Test No.	Test Vehicle	Test Type	Test Speed	Stopping Distance	Average Deceleration
1	Suzuki 125 ER - left side (side stand)	Slide	74 km/h	41.9 m	.51g
2	Suzuki 125 ER - left side (side stand)	Drag	-10 km/h		.51g
3	Suzuki 125 ER - left side (side stand)	Slide	90 km/h	60.2 m	.53g
4	Suzuki 125 ER - left side (side stand)	Drag	-10 km/h		.42g
5	Suzuki 125 ER - left side (side stand)	Slide	40 km/h	14.0 m	.45g
6	Suzuki 125 ER - left side (side stand)	Slide	54 km/h	25.0 m	.45g
7	Suzuki 125 ER - left side (side stand)	Drag	-10 km/h		.42g
8	Suzuki 125 ER - right side (no side stand)	Slide	55 km/h	31.0 m	.38g
9	Suzuki 125 ER - right side (no side stand)	Drag	-10 km/h		.37g
10	Suzuki 125 ER - right side (no side stand)	Slide	77 km/h	68.8 m	.34g
11	Suzuki 125 ER - right side (no side stand)	Drag	-10 km/h		.34g
12	Suzuki 125 ER - right side (no side stand)	Slide	41 km/h	18.30 m	.36g
13	Suzuki 125 ER - right side (no side stand)	Drag	-10 km/h		.34g
14	Suzuki 125 ER - right side (no side stand)	Slide	92 km/h	83.20 m	.40g
15	Suzuki 125 ER - right side (no side stand)	Drag	-10 km/h		.34g

Test No.	Test Vehicle	Test Type	Test Speed	Stopping Distance	Average Deceleration
1	Honda C-90 - right side	Slide	73 km/h	33.9 m	.62g
2	Honda C-90 - right side	Drag	-10 km/h		erratic
3	Honda C-90 - right side	Slide	92 km/h	57.7 m	.58g
4	Honda C-90 - right side	Drag	-10 km/h		.55-.61g
5	Honda C-90 - right side	Slide	40 km/h	11.15 m	.56g
6	Honda C-90 - right side	Drag	-10 km/h		.55g
7	Honda C-90 - right side	Slide	54 km/h	23.0 m	.50g
8	Honda C-90 - right side	Drag	-10 km/h		.43-.49g
9	Honda C-90 - left side	Slide	40 km/h	11.8 m	.53g
10	Honda C-90 - left side	Drag	-10 km/h		.55g
11	Honda C-90 - left side	Slide	92 km/h	63.7 m	.52g
12	Honda C-90 - left side	Drag	-10 km/h		.49g
13	Honda C-90 - left side	Slide	52 km/h	20.1 m	.53g
14	Honda C-90 - left side	Drag	-10 km/h		.43-.49g
15	Honda C-90 - right side	Slide	75 km/h	39.8 m	.56g
16	Honda C-90 - right side	Drag	-10 km/h		.49-.55g
17	Honda C-90 - left side	Slide	76 km/h	46.3 m	.49g
18	Honda C-90 - left side	Drag	-10 km/h		.49g

Test No.	Test Vehicle	Test Type	Test Speed	Stopping Distance	Average Deceleration
1	Yamaha TZR125 - right side (fairing)	Slide	80 km/h	56.0 m	.45g
2	Yamaha TZR125 -	Drag	-10 km/h		.42-.47g

Test No.	Test Vehicle	Test Type	Test Speed	Stopping Distance	Average Deceleration
	right side (fairing)				
3	Yamaha TZR125 - right side (fairing)	Slide	39 km/h	11.05 m	.54g
4	Yamaha TZR125 - right side (fairing)	Drag	-10 km/h		.37g
5	Yamaha TZR125 - right side (fairing)	Slide	87 km/h	73.9 m	.40g
6	Yamaha TZR125 - right side (fairing)	Drag	-10 km/h		.33-.37g
7	Yamaha TZR125 - right side (fairing)	Slide	55 km/h	30.3 m	.39g
8	Yamaha TZR125 - right side (fairing)	Drag	-10 km/h		.37-.42g
9	Yamaha TZR125 - left side (no fairing)	Slide	50 km/h	12.4 m	.79g
10	Yamaha TZR125 - left side (no fairing)	Drag	-10 km/h		.61g
11	Yamaha TZR125 - right side	Slide	40 km/h	16.0 m	.39g
12	Yamaha TZR125 - left side	Slide	40 km/h	10.6 m	.59g
13	Yamaha TZR125 - left side	Drag	-10 km/h		.51-.56g
14	Yamaha TZR125 - right side	Slide	95 km/h	85.5 m	.41g

Test No.	Test Vehicle	Test Type	Test Speed	Stopping Distance	Average Deceleration
15	Yamaha TZR125 - left side	Slide	78 km/h	51.3 m	.47g
16	Yamaha TZR125 - left side	Drag	-10 km/h		.48-.53g

Donohoe, M.D. "Motorcycle Skid Test Data," SOARce, (July 1991): 22-23.

This article presents the results of series of braking tests and drop tests performed by the Los Angeles Police Department Specialized Collision Investigation Detail. The motorcycle was towed to a given speed, released and allowed to travel to final rest uncontrolled. On one of the tests, the motorcycle refused to go down and reportedly followed the tow vehicle for about 150 yards before leaving the roadway and overturning.

Vehicle – 1982 Kawasaki KZ 1000 Police Special				
Roadway – Asphaltic concrete, sharp, 4% downgrade - Vehicle - 1986 Chev. Caprice, 4 dr, Police vehicle				
Test No.	Radar Speed (mph)	Velocity (fps)	Skid Dist. (ft)	μ
1	35	51.45	84.50	0.48
2	39	57.33		This is the one that DIDN'T go down
3	41	60.27	119.08	0.47
4	38	55.86	125.16	0.38
5	39	57.33	100.25	0.50
6	47	69.09	192.00	0.38

Scott, John C. "TEEX Motorcycle Accident Reconstruction course tests," 1994.

The summary sheet prepared for the five drop tests performed during this training course. There is no specific methodology listed on the data sheet, but it is understood that the motorcycle was towed upright, then released and allowed to fall to the pavement.

Bike	Distance	Radar Speed	f
Suzuki GS 450	77.2 ft	36 mph	0.55

Suzuki GS 450	113.7 ft	45 mph	0.55
Suzuki GS 450	156.8 ft	51 mph	0.55
1979 Yamaha	98.3 ft	46 mph	0.71
1973 Yamaha Enduro 360	128.5 ft	45 mph	0.53

Craig, Victor. “Joint Conference Motorcycle/Car Crash Tests and Motorcycle Slide Tests,” *Accident Investigation Quarterly*, (Winter 1995): 48.

Article reviews the results of three motorcycle crash tests and two drop tests. The author reports that the presumed differences in drop height caused the differences in computed average drag factor for the two tests performed with the same motorcycle.

Test	Model	Speed	Distance	Ave. G	Notes
One	1971 Suzuki	39 mph	68 ft	0.75	Dropped from pickup
Two	TS 185	46 mph	128 ft	0.55	Dropped from lower level

Rafferty, Barry. "Determination of the Drag Factor of a Fairing Equipped Motorcycle," SAE 950197, (1995): 1-4.

This paper presents the results of drop tests performed with a motorcycle fitted with Suzuki Katana fairings. Although the total number of tests performed is not indicated within the paper, the average coefficient of friction is reported to be .26. One test was performed with the fairing removed from the motorcycle, with the calculated coefficient of friction being .33. The tests were presumably performed at speeds of approximately 80 to 85 kilometers per hour.

Medwell, Christopher J., McCarthy, Joseph R. and Shanahan, Michael T. "Motorcycle Slide to Stop Tests," SAE 970963, (1997).

This paper describes a series of tests performed on a 1992 Kawasaki Ninja ZX-7 that was dropped from a carrier mounted on the side of pickup truck. There were four tests performed, but two of the tests resulted in the motorcycle traveling on two distinctly different surfaces. The paper also contains tables of previous tests performed by various authors.

Test No.	Distance (m)		Drag Factor Average
	Asphalt	Grass	
1 (right side)	41	15	.45
2 (right side)	43	20	.40
3 (right side)	70	-	.36
4 (left side)	86	-	.29

Baxter, Albert, T. *Motorcycle Accident Investigation*, 2nd ed., Jacksonville, Florida: Institute of Police Technology and Management. 1997.

In Chapter VII of this manual, Baxter reviews the various literature on motorcycles sliding on their sides and the various tests performed by different authors. Baxter also includes a chart entitled, *Summary of drop-slide field tests conducted by IPTM*. He indicates that the chart is based upon the averages of 50 drop/slide tests over a range of test speeds. The summary does not include the model or type of motorcycles used during the various tests.

Speed	Surface f	Distance	f Value
25 mph	0.82	36 feet	0.54
32 mph	0.75	66 feet	0.49
39 mph	0.79	96 feet	0.51
42 mph	0.78	108 feet	0.59
48 mph	0.82	135 feet	0.62
51 mph	0.90	165 feet	0.55

Limpert, Rudolf. *Motor Vehicle Accident Reconstruction and Cause Analysis*, Third ed. Charlottesville: The Michie Company, 1989.

Limpert, Rudolf. *Motor Vehicle Accident Reconstruction and Cause Analysis*, Fifth ed. Charlottesville: LEXIS Publishing, 1999.

The later versions of this text contain some references to motorcycle collisions and sliding friction values. The Fifth Edition contains a single reference to a 1985 paper by Manfred Becke, while the Third Edition contains two other references that were excluded from the later text. The tables in both versions contain slightly different values for unexplained reasons. It is likely that the author has used other data that is not referenced in order to create these tables, since there is a wider range of data contained in the Fifth Edition, yet fewer references are noted.

Fifth Edition			
Motorcycle Side Sliding			
Motorcycle	Deceleration, g-units		
	30 mph	50 mph	65 mph
Heavy, Pavement			
Moped, Pavement	0.5 to 0.55	0.40 to 0.50	0.35 to 0.40

Bicycle, Pavement	0.75	0.65	0.60
With fairing	0.3 to 0.4		
Without fairing	0.35 to 0.5		
On grass	0.9 to 1.1		

There is an obvious error in the table found in the Fifth Edition of Limpert's book. A comparison of the data contained in Third Edition versus the Fifth Edition suggests that the "Heavy, Pavement" values are missing on the newer table and that the values are not aligned properly with their titles.

Third Edition			
	Speed (mph)		
Type	30.00	50.00	65.00
Heavy	0.5 to 0.55	0.40 to 0.50	0.35 to 0.40
Moped	0.75	0.65	0.60
Bicycle	0.80	0.70	0.65