

# CA<sup>2</sup>RS

## California Association of Accident Reconstruction Specialists

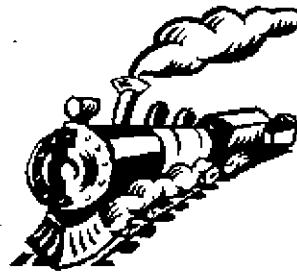
No. 3

September 1998

### NEWSLETTER

What a day it was for CA<sup>2</sup>RS members on Wednesday, July 22, 1998. This day was the first opportunity CA<sup>2</sup>RS has had to do a field study, and despite the short time allowance we had, it was a success. The group was able to obtain valuable information from various motorcycle skid and drop tests performed on this day, which is enclosed for members in this newsletter.

Since our first meeting in April of 1998, our membership for CA<sup>2</sup>RS has grown from 12 members to 73 members! Because of the large number of members and because of the rate of growth of our organization, a new method of listing members will be used in the near future. We are trying to use our resources for better training, rather than for the use of paper for listing one member per page. This new listing will be distributed annually, at a meeting closely following the beginning of each fiscal year (usually October meetings).



### Grade Crossing Collisions with Trains

Our next meeting is on October 21, 1998 from 8:30 to 4:30 p.m. We found that the length of time for our previous training would have been easy to extend and much more information could be covered. The upcoming training session will include:

- ♦ A review of information from previous training session July 22, 1998 (approx. 2 hrs.)
- ♦ A field demonstration (approx. 2 hrs.)
- ♦ An instruction session by Lt. Carolyn Slezak (approx. 3 hrs.)

Morning refreshments will be provided.

#### CA<sup>2</sup>RS ADMINISTRATIVE CONTACTS

Jennifer Johnson or Nancy Degger

3650 Mt. Diablo Blvd., Lafayette, CA 94549

Bus. (925) 284-7739

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E-mail: RDegger@ix.netcom.com

**NEXT MEETING**

Hosted by: San Jose Police Department  
 Presented by: Amtrak Police Department  
 Phone: (408) 277-4654  
 Location: San Jose Police Department, Room 314  
 201 W. Mission St.  
 San Jose, CA 95110  
 Date: October 21, 1998  
 Time: 8:30 A.M. - 4:30 P.M.

**Schedule of Events****September 1998**

		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

28-Oct. 2 Intermediate Accident Investigation Class  
 by Los Medanos College in Concord. For  
 information call 925-439-2185 ext. 242.

**October 1998**

				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

5-9 Motorcycle Accident Investigation Class  
 by IPTM in San Jose. For information call  
 904-620-4786.

5-16 Advanced Accident Investigation Class by  
 Los Medanos College in Concord. For  
 information call 925-439-2185 ext. 242.

21 CA<sup>2</sup>RS Quarterly Meeting  
 San Jose Police Department, Room 314  
 8:30 A.M. - 4:30 P.M.

**November 1998**

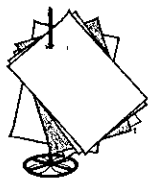
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

2-6 Intermediate Accident Investigation Class  
 by Los Medanos College in Concord. For  
 information call 925-439-2185 ext. 242.

**IMPORTANT!**

If you are planning to attend our next quarterly meeting on October 21, 1998 for our "GRADE CROSSING COLLISIONS WITH TRAINS" training, we will need you to **R.S.V.P.** by October 9, 1998 in order to arrange for appropriate capacity and refreshments. If you intend to bring guests, please also indicate how many you will be inviting.

Please call Kevin Cassidy at (408) 277-4654 or fax at (408) 227-8477.

**Note**

If you are a new member in good standing, your official CA<sup>2</sup>RS binder will be available at the October 21, 1998 meeting. If you have already been issued a CA<sup>2</sup>RS binder, please bring it to the meeting for updated information.

## Blurbs from the Board

### Board of Directors

#### CHAIR

Kevin Cassidy – San Jose Police Department

#### VICE CHAIR

Duane Tannock – Palo Alto Police Department

#### DIRECTORS AT LARGE

Al Sutcliffe – San Jose Police Department

Jim Willette – Mountain View Police Department

Rudy Degger – Rudy Degger & Associates, Inc.

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I'd like to start off by thanking all of those people who participated in the last meeting of CA<sup>2</sup>RS and contributed to its success. The turnout was more than we imagined and I appreciate everyone's patience with the seating accommodations. The size of cars has increased greatly and our Administrative Assistant Jennifer has been kept hard at work processing all of the applications. I think that the association now has the momentum we need to be successful.

Regarding the last meeting, I'd like to specifically thank Officers Jim Willette (Mountain View PD) and Karl Pringle (San Jose PD) for assisting me in the trailer as we dropped the motorcycles for the tests. After being so securely strapped in by the San Jose PD, I think the most hazardous and difficult part of the process was finding a safety helmet that I could get my head into. Additionally, I'd like to thank Officer Al Sutcliffe (San Jose PD) for his driving skills and making sure we didn't turn the test into a pedestrian drag experiment. Finally, I'd especially like to thank Board Member Rudy Degger (Rudy Degger and Associates) for volunteering to teach the class and offering his vast experience in the subject matter. I'd encourage those of you who have expertise in specialty areas of accident reconstruction, and preferably also have some type of teaching experience, to approach the Board for consideration in future meetings. We can all learn a lot from each other as well as from inviting outside speakers.

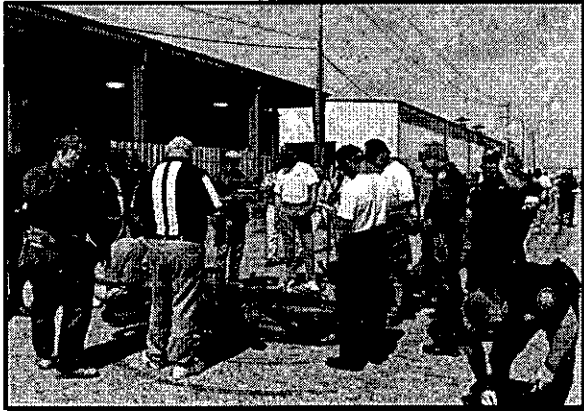
On the subject of training, there is a series of programs coming up on "The Learning Channel" that should be of interest to CA<sup>2</sup>RS members. The series is called "Crash Science" and includes three segments. The first, "the Driver", will be shown on October 21<sup>st</sup> at 6:00 PM. The second, "What Happened?", will be shown on October 21<sup>st</sup> at 7:00 PM. The third, "Searching for the Safer Car", will be shown on October 22<sup>nd</sup> at 6:00 PM. (Check local listings for that week to ensure that the times haven't changed.)

You should already know from other parts of this newsletter that our next meeting will include training on grade crossing collisions with trains. It should be very informative and I hope to see you all there.. As always, the Board welcomes any suggestions on how to improve the association for future training topics.

Kevin Cassidy  
Chairperson

## Photographs from the Field!

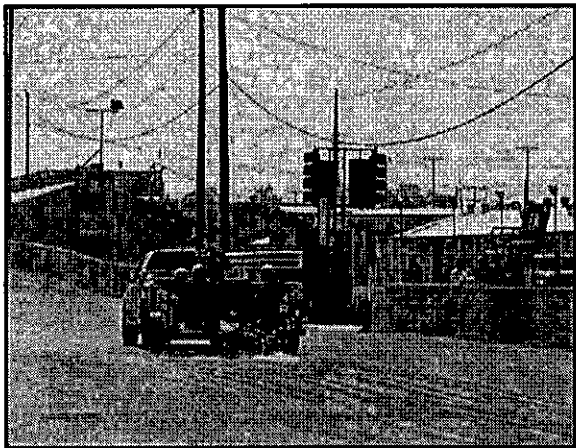
Following are some photographs taken at our last training meeting in July.  
Some of you may find yourselves in them!



Making observations after a motorcycle drop test.

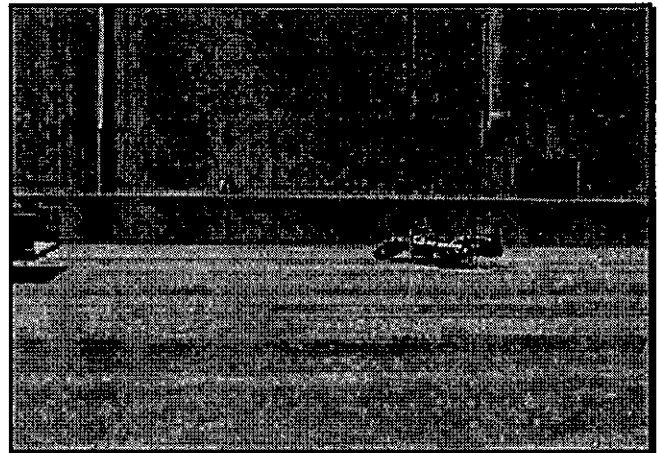


Dave Beals examines the first skid mark.



*Photo courtesy of Mark Dang, Alameda P.D.*

Kevin Cassidy, Jim Willette, and Karl Pringle dropping a motorcycle from the rear of a trailer for a drop test, while Al Sutcliffe drives the pickup.



*Photo courtesy of Mark Dang, Alameda P.D.*

Motorcycle sliding on asphalt after being dropped from the rear of the trailer.

# MOTORCYCLE SPEED DETERMINATION

by  
Rudy Degger, ACTAR

## ABSTRACT

Calculating the speed of a motorcycle that either overturns and slides on its side, or remains upright and is braked by the rider, requires accurate information about the coefficient of friction. Slide and brake test studies have been done by various individuals and groups. Generally, the expected friction values for a braked and/or sliding motorcycle on an asphalt or concrete surface are shown in TABLE 1 (*see appendix*).

Slide tests were conducted by the California Association of Accident Reconstruction Specialists (CA<sup>2</sup>RS) on July 22, 1998 to measure the coefficient of friction or drag factor for a braked and/or sliding motorcycle. The tests were sponsored by the San Jose Police Department and conducted at 328 Brokaw Road, in San Jose. Two test series were conducted. The first was a series of three brake tests: 1) rear wheel locked with rolling front wheel, 2) rear wheel locked with 50% to 75% front wheel braking, and 3) rear wheel locked with threshold front wheel braking. The second was a series of three drop tests; three different motorcycles were dropped and allowed to slide to a stop. All of the tests were conducted on asphalt which was in "traveled" condition.

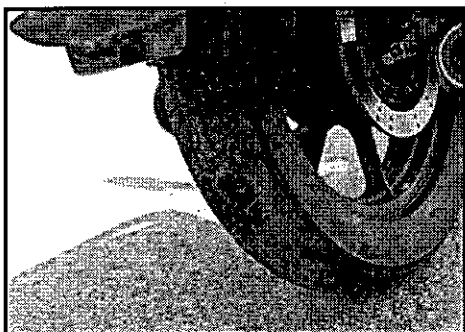
## INTRODUCTION

The tests were designed to address four concerns: First, determine the friction coefficient or drag factor for a motorcycle that either slides on its side, or that is braked by a rider; Second, compare the relationship between friction value and the road damage caused by a motorcycle that slides on its side; Third, compare the friction coefficient to the percentage of front brake application, and; Fourth, compare the tire abrasion or "speckling" on a braked front tire versus that of a rolling front tire.

On August 27, 1998, two controlled skid tests were conducted on this same surface with a non-ABS, 1988 Dodge Diplomat. The friction coefficient ranged from 0.69 to 0.81; an average of 0.74. The results (of the longest skid) are shown in TABLE 2 (*see appendix*).

## TEST SERIES 1

The first test series consisted of three brake tests. The motorcycle used was a 1994 Kawasaki 1000 Police motorcycle with a curb weight of approximately 750 lb. The rider weighed approximately 175 lb. The speed for each test was 30 mph, determined by two radar units, one positioned forward and one aft of the motorcycle's path. Speckling on the front tire was clearly visible after tests B and C. The results of the first test series are shown in TABLE 3 (see appendix).

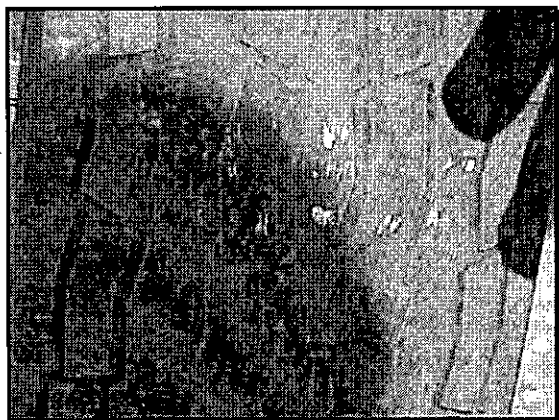


Rear wheel skid contact patch.

Typical "lazy S" skid pattern from locked rear wheel skid and no front brake application.



*Photo courtesy of Mark Dang, Alameda P.D.*



Speckling caused by 50+% front wheel brake application.

*Photo courtesy of Mark Dang, Alameda P.D.*

## TEST SERIES 2

The second test series consisted of three "drop" tests. Three different motorcycles were used: A 1977 Honda 750cc motorcycle in test D; A 1969 Honda CL450cc Scrambler in test E; And a 1979 Yamaha DOHC 750cc in test F. The motorcycles were positioned on a trailer pulled by a motor vehicle. After the motor vehicle reached the goal speed, the motorcycle was released from the trailer, causing it to overturn and slide to a stop. The results of the second test series are shown in TABLE 4 (*see appendix*).



Examining the Honda 750cc following the drop test.



Honda CL450c Scrambler after drop test.  
*Photo courtesy of Mark Dang, Alameda P.D.*

## ADDITIONAL TESTS

On July 17, 1998, in Phoenix, Arizona, the Southwestern Association of Technical Accident Investigators (SATAI) conducted motorcycle tests using two different motorcycles: a Kawasaki 1000cc weighing 575 lb. and a Yamaha 350cc weighing 260 lb. Neither motorcycle had a ferring or windshield. The Kawasaki had a front roll-bar and a rear luggage chassis, both made from chrome tubing. These assemblies stuck out from the sides of the motorcycle and prevented direct pavement contact by the engine components.

The goal of the tests were to crash the motorcycles into the side of a parked vehicle (broadside). Five attempts were made; Three tests were done with the Kawasaki and two were done with the Yamaha. However, both times the Yamaha fell over and slid to a stop on its side before reaching the parked vehicle. The Kawasaki completely missed the vehicle on its first test, and on its second and third test, it fell over, sliding and tumbling to a stop. Although the tests did not result in obtaining any relevant impact crush data for the motorcycles, the slide and tumble distances were measured for the purpose of determining the coefficient of friction and/or drag factor. The tests were conducted on "traveled" condition asphalt. Controlled passenger vehicle test skids were not conducted. The results of the SATAI test series are shown in TABLE 5 (*see appendix*).

## CONCLUSION

Based on these tests, the coefficient of friction and/or drag factor for a motorcycle that slides and/or tumbles to a stop on its side was found to range between 0.33 to 0.60 for "traveled" asphalt. This range fits within the accepted range of 0.30 to 0.80, normally associated with a motorcycle that slides and/or tumbles on its side on an asphalt and/or concrete surface.

The tests also show that front wheel brake application by the rider will (as expected) significantly increase the drag factor for a motorcycle and shorten the braking distance. Although the degree of front wheel brake application was subjectively measured in these tests, the tests show a rider can easily double the drag factor by applying as little as 50% front wheel brake application when braking. In addition, "speckling" is visible when this level of front brake application is made.



## Appendix

**TABLE 1**

Type of Event	Roadway Surface Criteria	Drag Factor
Motorcycle On Side: Asphalt and Concrete Road	Light Scratches	0.30 to 0.40
	Heavy Scratches	0.40 to 0.55
	Gouges and/or Tumble	0.55 to 0.80
Rear Brake Locked and Front Wheel Rolling	Asphalt and Concrete	0.25 to 0.40
Threshold Front & Rear	Asphalt and Concrete	0.90 to 1.10

**TABLE 2**

Speed	Distance	Drag Factor
1. 32 mph.	Impending Skid: 12.5 feet Locked Wheel Skid: 29.9 feet Total Skid Distance: 42.4 feet	0.81
2. 30 mph.	Impending Skid: 10.3 feet Locked Wheel Skid: 32.2 feet Total Skid Distance: 42.5 feet	0.71
3. 31 mph.	Impending Skid: 21.2 feet Locked Wheel Skid: 25.3 feet Total Skid Distance: 46.5 feet	0.69

**TABLE 3**

<b>Brake Dynamics</b>	<b>Distance</b>	<b>Drag Factor</b>
A. Rear wheel locked and front wheel rolling.	Impending Skid: 7.3 feet Locked Wheel Skid: 79.7 feet Total Skid Distance: 87.0 feet	0.34 [46% of the control test average]
B. Rear wheel locked and front wheel braked at 50 to 75%.	Impending Skid: 4.0 feet Locked Wheel Skid: 34.5 feet Total Skid Distance: 38.5 feet	0.78 [105% of the control test average]
C. Rear wheel locked and front wheel at or about threshold.	Impending Skid: 5.8 feet Locked Wheel Skid: 29.7 feet Total Skid Distance: 35.5 feet	0.85 [115% of the control test average]

**TABLE 4**

<b>Speed</b>	<b>Surface Condition / MC Dynamics</b>	<b>Distance</b>	<b>Drag Factor</b>
D. 32 mph	Light to medium scratches visible.	103.3 feet	0.33
E. 44 mph	Light to heavy scratches and some gouges were visible. The motorcycle rotated; leaving several tire scrubs.	146.0 feet	0.44
F. 51 mph	Light to medium scratches were visible. Tire scrub was first evidence of slide was at 262.4 feet and the first road damage [scratch] was at 230.0 feet	262.4 feet	0.33

TABLE 5

Speed	MC and Slide Dynamics	Distance	Drag Factor
G. 33 mph	Yamaha: Front wheel led the slide trajectory and there was some bounce and pavement contact by the front tire.	76.0 feet	0.48
H. 23 mph	Kawasaki: The MC slid to a stop on its right side; actual dynamics were not witnessed by the author. The Dynamics were described as little or no bounce, nor did the tires drag on the asphalt.	46.0 feet	0.38
I. 40 mph	Yamaha: The MC rolled several times, side to side, with the left side leading. The roll was severe.	97.5 feet	0.55
J. 34 mph	Kawasaki: The MC slid to a stop on its right side; actual dynamics were not witnessed by the author. The Dynamics were described as little or no bounce, nor did the tires drag on the asphalt.	68.0 feet	0.57

## Funnies From the Net



Memory of an accident in a Uniontown, Pennsylvania cemetery:

Here lied the body  
of Jonathan Blake  
Stepped on the gas  
Instead of the brake.

A lawyer's epitaph in England:

Sir John Strange  
Here lies an honest lawyer,  
And that is Strange.

Oops! Harry Edsel Smith of Albany, New York:

Born 1903 - Died 1942  
Looked up the elevator shaft to see if  
the car was on the way down.  
It was.

Jury: Twelve people who determine which client has the better attorney.

There are two kinds of pedestrians...the quick and the dead.

If you're living on the edge, make sure you're wearing your seat belt.

### *Just a reminder...*

If you would like information to appear in our newsletters you must submit your materials to Jennifer. For deadlines please call (925) 284-7739 or e-mail at [RDegger@ix.netcom.com](mailto:RDegger@ix.netcom.com)



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