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RES: 678-9164

July 14, 1988

Analysis and reconstruction of the July 10, 1986 accident which occurred on SR 59 at its intersection with Powdermill Rd. in Portage County and which involved a 1978 Toyota driven by Mr. Rick A. Scott and a bicycle ridden by Rebecca A. Mathes.

Materials and Information

1. Ohio Traffic Accident Report No. 67-1192-67 prepared by the Ohio State Highway Patrol and dated July 10, 1986.
2. patrol photographs of the accident scene, etc.
3. Statements given by Mr. Rick A. Scott and Ms. Kerry Belknap.
4. Other photographs of the accident scene and the Mathes bicycle.
5. An inspection of the accident scene on July 12, 1988.
6. Vehicle data from a N.A.D.A. Official Used Car Guide.
7. Coefficient of friction data from "Friction Applications in Accident Reconstruction" by C. Warner, G. Smith, M. James and G. Germane, SAE Technical Paper Series 830612.

Accident Description

The accident occurred on SR 59 at its intersection with Powdermill Rd. at ~10:05 AM on July 10, 1986. The weather was clear and the pavement was dry. SR 59 is straight in the accident area and it includes three lanes. There are an eastbound lane, a left turn lane and a westbound lane. SR 59 exhibits a very slight upgrade from west to east in the accident area. → less than 1-2°

A 1978 Toyota Celica driven by Mr. Rick A. Scott was initially eastbound on SR 59 in the eastbound lane. As the Scott Toyota approached Powdermill Rd. a bicycle ridden by Rebecca A. Mathes crossed SR 59 from north to south -65' west of Powdermill Rd. Mr. Scott steered his vehicle slightly to the right just prior to locking up his brakes. He skidded ~78' and

his vehicle was straddling the south white edge line when the left front corner struck the right side of the Mathes bicycle. The bicycle got wedged under the Toyota and Mr. Scott then rolled to final rest - 215' east of impact. After impact Ms. Mathes struck the left side of the windshield of the Toyota and then fell off the vehicle and came to rest in the intersection.

Figure 1 is a scale drawing of the accident intersection. It shows the vehicles at rest and at impact. Further, it shows the pre-impact skidmark of the Toyota and the scrapes and gouge indicated in the Traffic Accident Report.

Objective

1. To determine the pre-skid speed of the Scott Toyota.
2. To locate the Mathes bicycle when Mr. Scott reacted to it as a hazard.

Analysis

- A. Determination of the pre-skid speed of the Scott Toyota.

Here one needs to account for the dissipation of the Toyota's pre-skid energy of motion as work done against frictional forces in its skid and roll to final rest.

Equation: $v_i^2 = 2\mu_1 g d_1 + 2\mu_2 g d_2$

v_i = pre-skid speed of the Scott Toyota

μ_1 = 0.55 $\rightarrow$ 0.70 (coefficient of friction range for tires skidding on dry traveled asphalt from speeds greater than 30 mph)

g = 32.2 ft/sec²

d_1 = 78' (skid distance)

= 0.10 $\rightarrow$ 0.15 (drag factor for engine and drive train drag and rolling friction) $\times$ *but ok for moderate braking*

d_2 = 215' (roll-to-a-stop distance after the skid)

Result: v_i = 44 $\rightarrow$ 51 mph

minimum

- E. Location of the Mathes bicycle when Mr. Scott first reacted to it as a hazard.

Here, one must add the time for Mr. Scott's reaction to the pre-impact skid time. Then by assuming a rather slow speed of — 8mph for the Mathes bicycle one can determine where it was at the point when Mr. Scott reacted to it as a hazard.

(i) Time from Mr. Scott's ^{assumed} reaction to impact ^{reaction time (reasonable from literature)}
 $t_1 = 0.8 + \Delta v / \mu g$

Equation:

t_1 = time from Mr. Scott's first reaction to Ms. Mathes as a hazard to impact

$\Delta v = 19 - 20$ mph (speed loss due to the skid)

$\mu = 0.55 \rightarrow 5.70$

$\rightarrow$ if $\mu = .4$

$g = 32.2$ ft/sec²

Result: $t_1 = 2.1 - 2.3$ seconds

1.7 if $\Delta v = 14$ mph & $\mu = .7$

$t = 3$ sec (3.077s)

(ii) Location of Ms. Mathes when Mr. Scott first reacted to her as a hazard.

Equation: $d_2 = v_2 t_1$

d_2 = distance traveled by Ms. Mathes at 8 mph in 2.1 - 2.3 seconds

$v_2 \approx 8$ mph (normal slow bicycle speed)

$t_1 = 2.1 - 2.3$ seconds

Result: $d = 25' \rightarrow 27'$

20' (in middle of street)

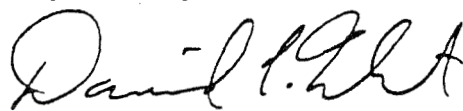
$d = 36'$
(at edge of street)

conclusions

1. The pre-skid speed of the Scott Toyota was in the range 44 → 51 mph. The speed limit on SR 59 is 55 mph.

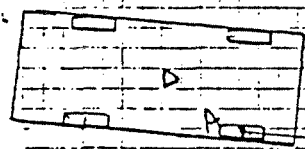
2. When Mr. Scott reacted to the hazard presented by Ms. Mathes and her bicycle, Ms. Mathes was just starting to cross the north edge of the center turn lane. Thus, Mr. Scott reacted well before Ms. Mathes entered the eastbound lane of Mr. Scott. His reaction of steering to the right and locking his brakes was typical of a driver who has perceived a hazard coming from his left.

Respectfully submitted:

A handwritten signature in black ink, appearing to read "David L. Uhrich". The signature is fluid and cursive, with the first name "David" being the most prominent.

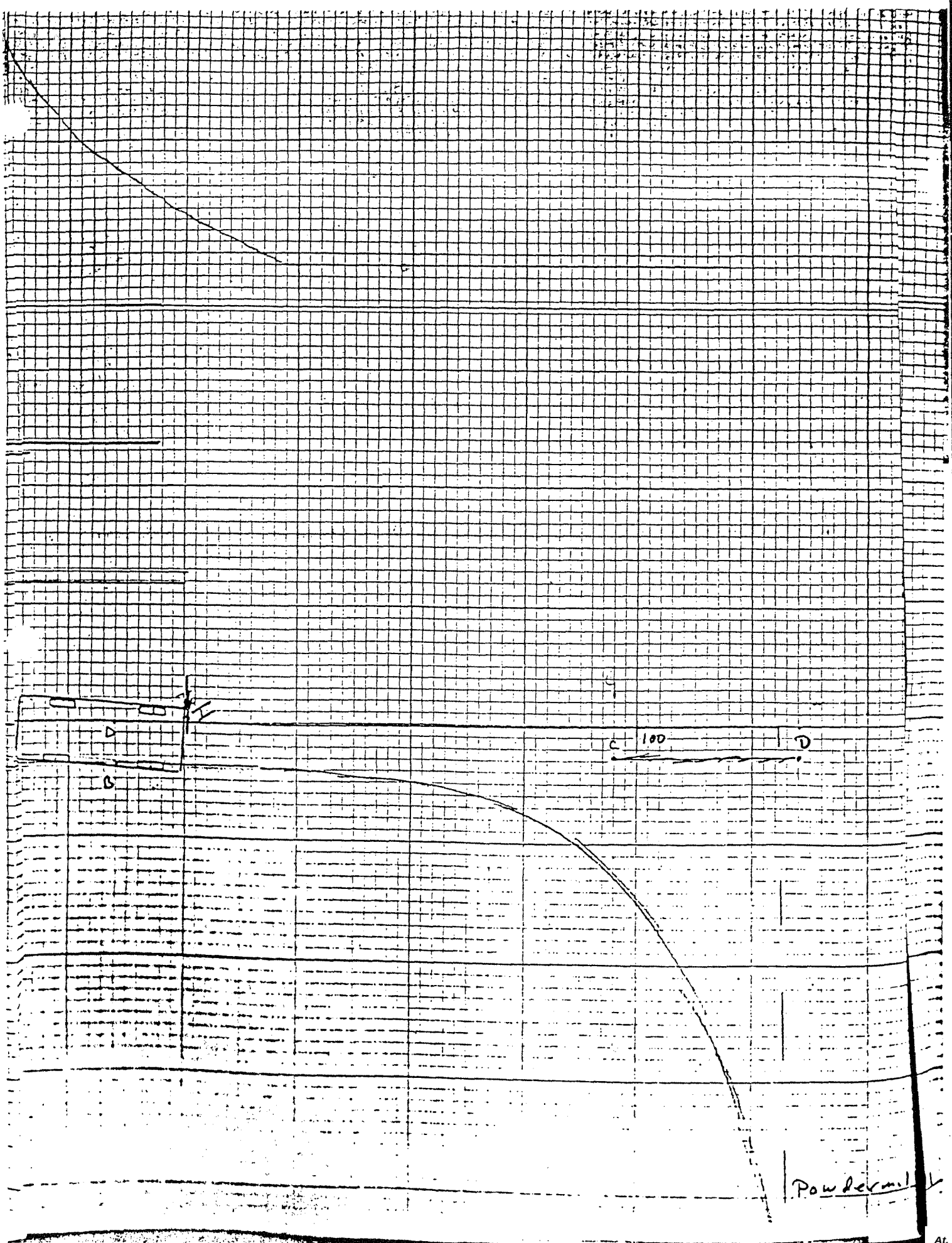
David L. Uhrich, Ph.D.
Professor of Physics

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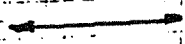
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Scale

1" = 10'



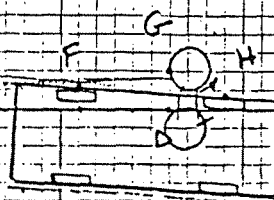


Figure 1