and Traffic gave some 300 subjects this test, but sufficient time has not elapsed to make a thorough analysis of the data However, a hurried inspection indicates the following

1 The average reaction time under No 1—that is, the time elapsing from the instant the light goes on to the time the applicant takes his foot off the accelerator—is about 0 1 per second Under No 2, or the time elapsing from the instant the light goes on and the applicant takes his foot off the accelerator and starts to apply the brake it is about 0 2 of a second

2 Within certain limits (16 to 55) chronological age is not very closely related to reaction time. At the upper end of the age scale, however, Dr Walter R Miles, Professor of Psychology, Yale University, has made tests which seem to indicate that the reaction time slows up considerably.

Unquestionably the reaction of the subject from the time he is given a signal to the time the brake is applied is a factor in an increase or reduction of motor vehicle accidents If a motor vehicle is going at a rate of 40 miles an hour and the reaction is 0.3 of a second longer than it should be a car will move approximately 20 feet during this period This may be sufficient to cause a serious accident

NOTES ON TRAFFIC SPEEDS

BY A N JOHNSON

Dean, College of Engineering, University of Maryland

SYNOPSIS

During the summer of 1933 the Maryland State Roads Commission in cooperation with the University of Maryland carried on a highway traffic speed survey to obtain comprehensive knowledge of the way traffic actually uses the state highways

The speed of traffic was observed at about 50 of the regular traffic census stations which the State Roads Commission has used for many years

At each point two observers counted and measured the speed of traffic from 9 A M until 4 P M. This was done by the use of the Eno Foundation speed detector as devised by Professor C J Tilden of Yale University About 500 vehicles were timed in each direction at each station

The average speed as observed from 41,000 vehicles was 35 5 miles per hour, with 87 per cent of all the traffic within 45 miles per hour and 99 per cent within 55 miles per hour and with only an occasional vehicle moving over 65 miles per hour

The percentage of various rate of speeds was

8 per cent between 15-25 miles per hour

36 per cent between 25-35 miles per hour

43 per cent between 35-45 miles per hour

12 per cent between 45-55 miles per hour

1 per cent between 55-65 miles per hour

During the summer of 1933, there was undertaken by the Maryland State Roads Commission, in cooperation with the University of Maryland, a traffic speed census. The object was to ascertain the speeds at which highway traffic moves over the state highways

For this purpose, traffic speeds were observed at 54 stations, as shown on the sketch in Figure 1 At each point selected, which corresponded to some regular traffic census station, two observers measured speeds from 9 A M until 4 P M One observer counted the traffic, divided as to direction, while the other observed the speed It was the plan to measure the speed of 1000 vehicles, 500 in each direction at each station At a number of stations, however, the traffic proved to be insufficient to make 1000 observations in the time available



Fig. 1

The method of measuring the speed was by the aid of an Eno Speed Detector, as developed by Professor C J Tilden of Yale University It is a very simple device which consists of a box with two sides open On the diagonal plane is placed a mirror The observer stands 176 feet from the mirror, which is placed so that objects moving along the road will be reflected to the observer's eye He notes the time on a stop watch as a vehicle goes by him and again as it is flashed in the mirror Thus, if this time is two seconds, it indicates a speed of 60 miles per hour, three seconds, a speed of 40 miles, and so on

This method of determining the speed of vehicles was checked several times by comparing the speed thus recorded with that indicated by state police on their speedometers No practical difference was observed

It was possible to carry on this work without attracting undue attention of motorists, in fact, but few of the drivers noticed it at all, and those that did had slowed up after the speed had been observed The highest average speed for any of the 54 stations was 47 miles per hour, with an average of 49 miles per hour for the east bound traffic, and 45 miles per hour for the west bound traffic This was on the Elkton-Glasgow Road, Route U S 40 There were six stations at which the average speed observed was over 40 miles per hour

The majority of the stations occupied for observing speed were in the zone where the legal limit is 40 miles per hour, the average speed in this zone being 37 miles per hour (See Figure 2, also Table I)

A few stations were occupied in more restricted zones In the 35mile zones, the average speed observed was 33 miles per hour

In the 25-mile zone, where traffic was observed at four stations, the average speed was 34 miles per hour





The following table shows the distribution of traffic according to speed in the 40-mile zone

10 per cent of all the traffic was within 15-25 miles per hour

32 per cent of all the traffic was within 25-35 miles per hour

45 per cent of all the traffic was within 35-45 miles per hour

11 per cent of all the traffic was within 45-55 miles per hour

2 per cent of all the traffic was within 55-65 miles per hour

It is seen that 87 per cent of the traffic was under 45 miles per hour, and but two per cent was over 55 miles per hour

Of the 52,704 cars timed, there were only 90 traveling faster than 60 miles per hour, divided as follows:

> 19 cars at 63 miles per hour 55 cars at 66 miles per hour 5 cars at 70 miles per hour 10 cars at 75 miles per hour 1 car at 80 miles per hour

	uan No of Vehicles	Timed			1,073	1,030	1 530	1,382	1,267	1,046	1,134	
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	peed	ធ	M	e Z01	3 4 30		8 6 4					
	Av S	z	ø	IN (34 36		37 35	35 37	36 40	4 0 4 4	
	Av Speed Vehicles Both	Directions M P H	-)†	32 {	35 {	39 {	36 {	36 {	38	42	Ì
	Av No Vehicles	Hourly			200	175	76	345	233	153	166	
	Traffic Station	Number			A-2	A-4	A-7	AA-1	AA-3	AA-6	AA-5	
	Road and Route				Cumberland-Frostburg, No 40	Cumberland-McCool, No 220	Cumberland-Hancock, No 40	Annapolis Boulevard, No 2	Annapolis Boulevard, No 2	Annapolis Boulevard, No 2	Craın Hıghway, No 3	

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TABLE I

MARILAND TRAFFIC SPEED SURVEY, 1933

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HIGHWAY RESEARCH BOARD

JOHNSON-TRAFFIC SPEEDS

764	1,149	597	´ 905	1,075	537	1,133	676	880	1,019	865	535
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37	36	31	ž	4	ž	, <del>4</del>	ň		~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	ۍ 
108	230	123	140	194	20	190	06	116	194	26	8
B-3	B-8	B-16	CE-1	CE-6	CE-9	CE-10	CL-1	CL-6	D-5	F-4	F-5
York Road, No 111	Belaır Road, No 1	Liberty Road, No 26	Conowingo-Rising Sun, No 1	Philadelphia Road, No 40	Elkton-Chesapeake City, No 213	Elkton-Glasgow, No 40	Westminster-Frizzellburg, No 32	Westminster-Reistertown, No 140	Cambridge-Jacktown, No 16	Frederick-Harpers Ferry, No 340	Emmitsburg-Frederick, No 15

							Pei	centa	ze of T	raffic	at Spe	seds S	hown				-	
Road and Route	Traffic Station	Av No Vehicles	Av Speed Vehicles Both	Av SI	peed	15-2	2	25-3		35-4		45-51		55-65	<u> </u>	fore t	han	Vo ot
	Number	Hourly	Directions M P H	z	ы	z	<u>ы</u>	z	 	 Z.	B	z	<u>н</u>		<u>µ</u>		ы	Timed
				s	M	02		-   22	8	50	8	v		0	8	00	A	
			40 Mile	Zone	ပို	ntını	led				ĺ							
Frederick-Baltimore, No 40	F-10	137	35 {		35 35		86				44 84		6					903
Frederick-Rockville, No 240	F-13	145	38 {	38 38		40		30 <u>5</u> 6				14		3 H				857
Frostburg-Grantsville, No 40	G-8	69	42 {		42 42		6 33	<u>.</u>	13		40 40		82 88		4 00		<u>.</u>	525
Belarr-Conowingo, No 1	H-4	136	39 {	37 41		5 3		30		52	•	27		3 1			<u>.</u>	891
Belaır-Baltımore, No 1	6-H	266	37 {	37 37		с <del>4</del>		31 29		55		12						1,282
Philadelphia Road, No 40	H-10	242	40	42 38		4		13		22 22		29		1.5				1,076
Frederick Road, No 40	Ho-3	127	37 {	36 36		5 5		33 27		50 50		16		5 1				1,355
Chestertown-Church Hill, No 213	K-5	65	32 {	33 31		15 20		43		37 33		5				<u> </u>		507

TABLE I-Continued

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HIGHWAY RESEARCH BOARD

JOHNSON-TRAFFIC SPEEDS

Rockville–Frederick, No 240	M-3	161	40	41 39		0 0			51		24 21					1,019	
Norbeck-Sligo, No 97	M-6	115	38 {	39 37		ດດ	3 5		53		19 15		1 7			808	~
Rockville-Washington, No 240	7-M	203	42	42 47			22		49 49		29 32		ດ			1,223	
East-West Highway, No 410	M-10	200	37 {		36 38		~ ~ ~	33		55 54		8 18		3 1		1,233	~
Baltımore-Washıngton, No 1	P-1	517	43 {	42 44			- H H		50 38		29 42		40			1,865	10
Baltımore-Washıngton, No 1	P-2	665	42 {	42 40		<del>_</del>		<u> </u>	52		32 25		4 છ			1,771	_
Defense Hıghway, No 50	P-4	174	34 {		36 32			4 36		51 35		φer				806	~
Craın Hıghway, No 4	P-7	78	36 {		38 34		N 0	<b>4</b> 5		50 43		17 5		1 2		201	_
Camp Spring-T B, No 5	P-9	74	38		39 37			36 28		53 47		22 13		1 2	<u></u> <u> </u>	22(	_
Camp Spring-D C Line, No 5	P-10	118	35		36 34	<u> </u>	10			47 47		10				344	
Marlboro Pike, No 4	P-20	135	34		35 33		<u></u>	4 4		<b>44</b> 38		11 5				818	œ
Easton-Preston, No 213	T-4	85	35		35 35			8.4		48 36		11 3				24	ñ

				[ 4	Conc	papni	Pen	centag	e of Tr	affic at	Speed	ls Sho	um				
Ż	<b>Fraffic</b> Station	Av No Vehicles	Av Speed Vehicles Both	Av Si	peed	15-25		25-35		35-45		12-55		5-65	More	than 35	No of Vehicles
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				l va	»	0	8	0	~	<b>B</b>	<u></u>	<u> </u> ≩	00 		00	8	
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<b>N</b>	V1-4	162	35 {	33 37		6 9		22	<u>с 4</u>	9 80	13.4						1,042
	N1-6	129	31 {	, 31 31		17 15				<u>ې د</u>							1,312
<u> </u>	V1-7	118	35 {	_	3 <b>4</b> 36		2 2		61		<u> </u>	11 3					918
	Vo-3	137	35 {		34 36		5		2 6	45		15					961
			37 {				9		20 20	4		- 11		6			Total 45,348

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HIGHWAY RESEARCH BOARD

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JOHNSON-TRAFFIC SPEEDS

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			2	117 117 1										
Belarr Road, No 1	B-9	325	32	32		~ ~	52	~~~~ 		6 CN				1,044
York Road, No 111	B-52	428	34	35		6	37 51			10	1			1,152
Average			33		   		49	<del>4</del>		4	   	<u> </u>	 	
			8	6 Mil	e Zon									
Reistertown Road, No 140	B-5	222	36	39		14 1	45 23	~~~~~	, 	N 90	°			873
Reistertown Road, No 140	B-15	350	34	34 34			49 48	শ শ	0.10	ະດີ ເບ				1,040
Philadelphia Road, No 40	B-10	308	32	33		10	46 55		0	5 3		<u>.                                    </u>		1,069
Baltımore-Washıngton, No. 1	B-18	716	35	36 34		5 5	31 56	<u>70</u> 4	00 10	3				1,442
Average			34			9	43	4	4	9	1			
			3	II W O	e Zon	9								
						Less than 15	15-		25-35	35-45	45-5	55	55-65	
Harford Road, No 147	B-7	223	26	27 25		1	38 21	2.5	1 6	10		,		736
Average						1	29	ດ 		14	1			

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35 Mile Zone

The car traveling at 80 miles per hour was on the Elkton-Glasgow Road, two miles east of Elkton

On three roads it happened that counts were taken on the same day as the county fairs and the speed records show that the cars traveling towards these events were going at a much higher rate of speed than the cars going in the opposite direction

Thus, at station AA-5 on the Crain Highway, the average speed of the traffic during the rush to the races was 48 miles per hour, while the speed of traffic in the opposite direction was but 39 miles per hour

In all, of the 52,704 vehicles that were timed, 45,348 were at stations within the 40-mile zone, and the remainder were in the lower speed zones

From the results obtained, it appears that 40 to 45 miles per hour is a reasonable regulation, which is observed by the large majority of drivers in all parts of the state The driving public on our highways is content. for the most part to jog along at a moderate rate of speed



Figure 3. Relation Between Width of Pavement and Speed of Traffic

The relation that the width of pavement has upon speed of traffic was studied but without convincing results

For this purpose the data were assembled in Figure 3 showing the average speed at the different stations, arranged according to width of road

In this figure, each of the ordinates represents the mean of observations taken at a single station, averaging about one thousand vehicles per station It will be noted that the average for each of the different widths is not far from the same value, about 35 or 36 miles per hour

One thing that is notable is that the 18, 17 and 16-foot widths, while maintaining the same average speed as the wider widths of roadway, do not show as great a variation It is evident that more data than are here presented will be required to determine definitely what effect the width of the roadway has upon the speed of traffic

## DISCUSSION

### ON

### HIGHWAY TRAFFIC SPEEDS

CAPTAIN L. A. LYON, Deputy Superintendent, Uniform Division, Department of Public Safety, Michigan: This Department has recently completed a survey of the speeds at which motor vehicles are being driven on the Michigan highways. This survey was made by all of the officers of the Department while on their regular patrols, either with motorcycle or patrol car. The checks were made on all types of highways and under various weather conditions, from the congested area around Detroit to the lonesome trails of the far north.

The officers were instructed to pace the first ten vehicles they could on the various types of roads each day for two weeks. Thus, they did not pick out passenger cars or high speed vehicles. They were also instructed to make the check without the knowledge of the driver of the vehicle, if possible.

Cars were checked under the following conditions:

- 47 per cent during daylight.
- 53 per cent during darkness.
- 16 per cent during rain or on wet roads.
- 10 per cent on gravel roads, and the balance on various types of hard surfaced roads, mostly concrete.

The percentages of the vehicles traveling at the various speeds were as follows:

25 miles per hour and under	5
30 miles per hour	9.7
35 miles per hour	12.6
40 miles per hour	20
45 miles per hour	17.9
50 miles per hour	16.6
55 miles per hour	8.6
60 miles per hour and over	9.6

Little difference in average speed can be noted as between wet and dry roads.

On paved highways the average speeds were: during daylight, 43.3 miles per hour; during darkness, 41.5 miles per hour.

Two per cent of all vehicles checked on pavements in daylight hours were trucks; 1.5 per cent during night hours were trucks.

On gravel highways the average speeds were: during daylight 39.8 miles per hour; during darkness 34.0 miles per hour.

On gravel roads 4.5 per cent of all vehicles checked in daylight hours were trucks; during darkness 3.7 per cent were trucks.

Sixteen per cent of all cars checked were of foreign registration and were probably through traffic, and nearly all on pavement. The average speeds were during daylight, 48 1 miles per hour, during darkness, 47 2 miles per hour.

The cars that were apparently from some other part of the state and could be classed as through traffic constituted 227 per cent The average speeds were: during daylight, 483 miles per hour; during darkness, 48 miles per hour.

We find that the average speed of all vehicles checked on all types of highways and under all weather conditions is 43 7 miles per hour

The above data are all we can obtain from the reports as submitted With this experience we expect to make a more detailed survey in the coming year, and would like suggestions as to data that should be included

The results of the survey seem to indicate that 45 miles per hour is a good average speed, and that a regulation declaring speeds in excess of that figure to be prima facie evidence of unreasonable speed would be in order

## ALCOHOL AND MOTOR VEHICLE DRIVERS

## By DR W R MILES

### Yale Institute of Human Relations

### SYNOPSIS

A man may keep his car right side up and on the road when he is too intoxicated to walk but this fact is not reassuring to others on the highway Although beverage alcohol appears to give subjective stimulant action to a person, its real effect is a depressant action on most of the functions of body and mind The alcohol effect which interferes with driving ability is fourfold. (1) A poorer grade of attention to external signals and environment, (2) Slower responses of eyes, hands and feet, (3) Less dependable, that is more variable, muscular responses, (4) Increased self assurance which prompts to the assumption of right-of-way and willingness to take a chance Although alcohol is directly mentioned in only 7 to 10 per cent of fatal highway traffic accidents, it is the belief of informed traffic officials that one-third of such accidents are at least partly chargeable to use of alcohol by the driver Officials need a method to definitely determine whether a driver is intoxicated as a basis for court action Determination of percentage of alcohol in the blood or urine by biochemical means is a feasible undertaking This method should be tried out in some representative areas to secure scientific data in this controversial field

The motor car of today is a splendid mechanism, comfortable, responsive and powerful, a truly marvelous extension of the human personality but it can not drive itself, society counts on its being used by responsible people who have reached and are maintaining the human adult level of understanding and emotional balance A large army of engineers is continually at work improving the automobile in all possible ways