COMMENTS ON AUTOMOBILE TRAFFIC

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PREFACE

The body of this paper is from a letter addressed to a legislative committee. A condensation was prepared and published by a national magazine in September, 1958.

I have had an urge for years to do an article in which automobile accidents would be placed in a broader perspective than is usually done, but have never found the time to drive a really thoughtful project on this topic to completion. A few months ago a broadside issued by a traffic safety committee crossed my desk. At the end of a series of questions, soliciting the reader's views on what seemed to me minor issues, was an invitation to write a letter to the chairman — if one had views not covered by the questions. That described my situation exactly, and I yielded to the impulse; perhaps by writing such a letter I could take the first tentative step toward an article.

Subsequent events were more than I had bargained for. An important magazine learned of the letter and wished to publish a condensation of it. I agreed, though somewhat uneasily; for while I wanted to publish an article on the subject, I wanted to write one first, and I was astonished at the notion that I had already done so. Next, an emergency developed in which the magazine needed the piece immediately, and I agreed that the condensation could be prepared and published without my review. I am not happy with the result,
so I have decided to make the original version available in the RAND P-series.
SUMMARY

An attempt is made to view automobile fatalities in context. The thesis set forth is that a substantial number of fatalities is an inevitable consequence of an operation of the magnitude and character of that conducted on our highways; that the present rate is not alarming when viewed against the value we derive from the automobile; that the rate can probably be reduced, but that it is important to use only such measures as do not simultaneously reduce its utility.
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The topic of automobile accidents is invariably viewed as if through a microscope, which tends to emphasize a lot of local and sometimes gruesome details, but which does not give a useful general picture of the phenomenon. If you invariably examined cheese in this way, the nature of the little beasties would undoubtedly affect your attitude toward a healthful and tasty food. My technical knowledge of cheese is very weak, but I believe you cannot eliminate the beasties without eliminating the cheese. Worse, I infer that there is a desirable level of beastly activity. Similarly, I am sure that you cannot eliminate automobile accidents without eliminating the automobile. I am also almost sure that there is, in effect, a desirable level of automobile accidents, from some sufficiently broad point of view — desirable at least in the sense that it is a necessary concomitant of things of greater value to the society. Now every ounce of energy I have seen devoted to the subject has been aimed at reducing the present level. I should like to make the point that this may or may not be a useful aim. If the question is really open, then one should think about it pretty hard before attempting to change it.

There is a philosophical issue on values which should be mentioned briefly, though I am not well qualified to deal with it. We accept it as a creed that human life is priceless, and
react involuntarily against anything which kills. I believe that in so doing we confuse the values of the individual and of the society. For instance, my life is, in a sense, priceless to me; there are probably things for which I'd give it up, but it isn't something I regard as part of my normal stock in trade. It is worth a lot to my family, but clearly it is less fundamental to them than to me. It is worth less to my associates than to my family, less to my community than to my associates, and so on. Finally, by the time we consider its value to our society, it is clearly sheer romanticism to say it is priceless. The fact is that the loss of my life would not produce an observable effect on the society, and this is literally true for most of us.

The automobile kills about 100 people a day, which seems terrible to the individual to whom death is the unique ultimate tragedy. But the society is more used to death and even needs it. Over 4,000 of our citizens die every day — and over 10,000 are born every day. It is evident that the deaths are going to climb to meet the births despite safety campaigns, medical progress, and the like. Otherwise we will be standing on each other's heads, an exercise poorly suited to the old people who will dominate the society. So I doubt that the present total number of deaths, of which the automobile accounts for two or three per cent, is undesirably large for the well being of the society, and it may in fact be undesirably small. From these facts we at least gain the perspective that the automobile is
not exterminating us, so we can afford to approach the problem calmly.

It isn't necessary to dismiss the 100 daily automobile deaths on demographic grounds as we have just done. By taking a little smaller view, one finds a different picture. To make the point, let us recall that a few years ago someone, under the stimulation of a hospital bed, conceived the idea of a national No Death Day (automobiles). To be against this would seem like being against Mother's Day, so men of good will everywhere supported it. They were duped into supporting a phony program. If the program were serious, we would just have to take the vehicles off the road for twenty-four hours. If we were to do that, we could have a No Death Day (automobiles), and it would be a day long remembered. On a normal day tens of thousands go to hospitals, but on this day tens of thousands would not. Doctors normally see hundreds of thousands of patients at home or office, but not this day. Firemen normally control thousands of fires, but not this day. Police normally control thousands of criminals and malefactors of all kinds, but not this day. And so on. In fact, we should be pretty lucky if the deaths in the population rose by only a thousand on No Death Day, and, if we were a little unlucky, they might look like the birth statistics. In fact the deaths associated with those 10,000 births alone might well exceed the normal automobile toll, instead of numbering about four. Of course the society normally creates over a billion dollars of wealth
on an average day, but it would not produce much on this day. So each of the lives we saved would be paid for with the lives of perhaps ten others and perhaps ten million dollars.

I don't think that a No Death Day is a good idea, but the contemplation of one can give us some clues to the importance of the automobile to our society. It immediately reveals that the automobile is a very important factor — perhaps the most important one — in producing the large gap between the numbers of births and deaths in the country. So the automobile has a large credit balance at the end of each day in precisely the coin we tend to worry about: lives. Incidentally, it is suggestive that the conspicuous life-saving operations absent in the No Death Day drama tend to be carried out at relatively high speeds and under dangerous traffic conditions.

Does the 100 deaths per day suggest that we are conducting the technical operation of mass transportation in a grossly careless manner? The general tone of public statements would certainly imply that this is so. Almost every person who has had access to and used mass media of communication to discuss traffic safety has contributed to the impression that the American motorist is grossly careless and thoughtless, and even bent on homicide. I don't read the record that way. He is presently operating over 65 million vehicles, which he knows very little about, under conditions which are often difficult. Practically all of the people in the country from
teen-age children to old men and women drive automobiles. As the years go by, fewer and fewer know anything technical about automobiles and their limitations. The principal technical achievement of today's driver is that he has some rudimentary notions about how to aim the vehicle. The quantity of kinetic energy loose on our roads — taking into account the increased numbers, weights, and speeds — is perhaps ten times what it was a quarter of a century ago. It is a startling fact that the daily death rate has remained essentially constant at about 100 per day over this same long period. Whatever else this proves, it should scotch the canard that the driver is maniacal.

It also proves that the use and utility of the automobile can be greatly extended without having the death rate bound out of control. But just as one shouldn't blame the driver for the fact that the death rate is 100, you shouldn't give him credit for the fact that the present 100 represents breakage from a much more imposing operation than the one he was performing twenty-five years ago. I am also afraid that our overt efforts at control of this symptom of a large operation — psychological attacks, legal and police action, etc. — have also had little to do with it. The dominant factor has been that the physical equipment has been improved. The most important improvement has been in the roads, which have tended to get wider, straighter, and smoother. There have been improvements in the vehicles too, probably the most
significant being those which have simplified the operation, thus permitting people with less knowledge and motor skills to participate successfully, but this is of secondary importance compared to the roads. Of course most of the roads are still marginal or worse.

The important fact about the automobile is not that it kills 100 people a day, but rather that it has been a crucial factor in the development of a fantastically complex and rich society. It has given us a new degree of personal mobility which we have exploited to develop the industrial complex, to provide ourselves with agreeable homes, a social life rich in choices, and a new degree of personal safety from the hazards of life. We may jeopardize our continued development of these things, and even what we have so far achieved, if we are only conscious of the disagreeable side effects, and if we seek to ameliorate these without regard to how we influence the main effects.

I don't know whether the most important factor in the relationship of the automobile to our present society is psychological or physical. Both are very important. The physical factor of greatest significance is unquestionably speed — precisely the item we have the strongest instinct to tamper with in the interest of reducing accidents. For consider that, while we move great loads of goods and people by road, the vehicle most characteristic is one that contains one person bent on a personal mission. If speed were not the
critical factor, this vehicle could be replaced completely and literally by a horse. The present city of Los Angeles could not exist if the citizen was limited to the speed of the horse. Neither could most of the present cities and social structure of the country. And the physical and social structure of the country may be almost frozen in its present attitude if we freeze the speed of the automobile.

I run some risk that you may conclude that I feel speed is the most important thing in life! Rather, I am trying to emphasize that it is one of the really crucial factors in our society. As with any of the crucial factors, it is promising to look for more. I cannot help but believe that we would manage better if we were conscious of this, rather than believing the exact contrary.

Even if one recognizes intellectually that speed is the essential physical element about traffic, there is an almost involuntary impulse immediately to add, "But not too much speed." Now no one could advocate "too much" speed — that's bad by definition — but the question of when does speed become too much is a very thorny question. I encounter situations where, in my opinion, 10 mph is too much, and others where 100 mph is not too much, and the variations in the situations are too great to be controlled very intelligently by fiat and in advance. The speed at which vehicles have in fact operated from time to time has been determined principally by the drivers, who want very much to live, who have substantial
personal investments in their hands (usually their largest or second largest), and who know that any injury they do to other persons or property will entail very unpleasant consequences. Their intelligence, judgment, and skill are not always a match for the situations, but in general they have managed to exploit the equipment available without undue damage. They generally drive faster than those who seek to control speed think they should, but as the interested parties on the spot their views are probably more nearly right than those of their critics. And while the typical driver couldn't formulate a good case for using as much speed as the situation warrants, he at least isn't burdened by the false doctrine that speed is the villain to be shunned at all costs. He is burdened by some feelings of guilt about the letter of the law, and he is subject to assault in the form of a fine or imprisonment if he is caught out of bounds even though the hazard be nil. This has been an unfortunate aspect of the development of the use of vehicles, but, like the death toll, tolerable. At least the utility of the automobile has managed to increase despite this brake.

It may become intolerable as the technical aspects of detection and control improve — the widespread use of radar, for instance — intolerable in the sense that the utility of the vehicle may be lessened by strong enforcement of inappropriate, however well-intentioned, laws. Our laws tend to be aimed at the limitation of speed rather than at the promotion of traffic flow.
I mentioned that both physical and psychological factors seem to play large roles in the use of automobiles. Consider the phenomenon of new communities. As our mobility has increased, we have built more cities. It would not be astonishing to discover, after the fact, that we average a new city when we average an increase of one mile per hour in speed. However, the growth of new communities is too prolific to be accounted for directly from the savings in time represented by the increases in speed. There is an interplay with the psychology of the driver which can be seen by considering an example: Suppose it is ten miles from a prospective homesite to work. It will require 15 minutes of travel time if the traveler can average 40 mph, or 20 minutes if he can average but 30 mph. This is the kind of example which anti-speed advocates love. It is obvious that the 5 minutes saved at 40 mph isn't worth much, directly. If the man earns five dollars an hour, it is apparently worth 42 cents, and he may expend rubber worth this much in one high-speed stop. The kinetic energy of the automobile increases as the square of the speed, so it is up by a factor of 16/9, an increase of almost 80%, which may be a fair measure of the increased hazard. So why bother with 40 mph? This analysis misses an essential point: **The driver is not motivated by those five minutes as minutes.** In fact he may not know within five minutes how long it takes. But it strongly affects important decisions. It may be that he has a feeling of
well-being when moving rapidly and one of intense irritation while sitting and staring at a red light. He may as a consequence decide not to live there after all. If he is typical, a community may not develop at that site, and ten thousand families may live drab lives which do not release their energies. So the five minutes, which means nothing to the individual driver and which is not very significant even when thousands of drivers are aggregated, may have a major effect on the society. Thus there is an apparently irrational factor which tends to increase the importance of speed. Or one may look on speed as a catalyst which triggers other forces. It has undoubtedly been strongly instrumental in developing our urban civilization. Unfortunately it is so sensitive that the lawmaker who frames an unnecessarily inhibiting regulation, the local authority who installs in the hamlet two unnecessary, ill-timed traffic signals, or even the man who paints a white line on the highway in the wrong place, can inadvertently impose on the society a shocking loss. Of course he is never shocked because he doesn't know it happened.

I have belabored the subject in this fashion because I suspect that my viewpoint is not the conventional one among persons concerned with traffic safety. Yet it seems to me that a simple, direct approach to traffic safety is likely to lead to a misformulation of the problem, which in turn leads to solutions which do more harm than good.
If one recognizes that the central problem is to promote the smooth and rapid flow of lots of traffic, he is likely to devise measures which will in fact operate in this direction. And if it flows smoothly and rapidly it won't look like a battle field — it will probably have reasonable safety, which may even turn out to mean 100 deaths per day. At least we know that that is an attainable number when the utility of the automobile is large and even growing. The number of accidental deaths at the ends of the line, at home and at work, is also about 100 per day, so it isn't a unique hazard in our lives.

Some measures to promote the flow of traffic are obvious and others are only apparent after detailed and technical analysis. I can not resist mentioning a few which have occurred to me, though they are mostly obvious ones, and of uneven importance.

The one-way road is just very important. The question, "Is it needed here?" can probably always be answered "Yes" if there is any possibility of financing it. For the problems of operating this massive system well on roads where opposing streams must use the same lanes are just hopeless. The speed is often determined by the slowest vehicle, and an attempt to pass a slower vehicle is an especially hazardous operation which we are ill-equipped to perform. It requires estimates of the separation and of the closing speed between two vehicles (the one you want to pass and the one approaching) which you don't control, and of the acceleration available in your
vehicle at some unknown speed. There is no reason to suppose that even a professional driver can solve so difficult a problem accurately. It is a wonder that the death toll from head-on collisions alone is not much greater than 100 a day. It is not greater because the drivers want to live, so they tend to match their speeds to those of the slower vehicles. Thus the cost to society of two-way roads is vastly greater than one would infer from the death toll on them, even though that is relatively high.

The person concerned with hazards per se should note the special dangers of opposing streams even when there is no need to share a lane. Moderate ground speeds (e.g., 40 mph) produce ferocious closing speeds (e.g., 80 mph) and any human error or mechanical failure can lead to death in both streams. For comparison, if they are going in the same direction even at 80 mph, the closing speed is zero and the hazard due to the same errors and failures is completely confined to one stream and largely to one vehicle. Most of our modern highway design does not adequately reflect this point since it does not provide impenetrable barriers between opposing streams. I believe it is offered in defense of this design that roads with barriers have more accidents (as opposed to fatalities) than those without. This must be a reflection of the amount of space available for maneuver. If so, it is a cogent argument for making roads as wide as possible, but it isn't necessarily a compelling reason for sharing two busy roads.
There are important unsolved management problems regarding our roads. We have very rudimentary organization and means for coping with trouble. Anything from a vapor lock to a major accident can lead to a snarl tying up thousands of vehicles for hours. We need powerful means for unsnarling these knots quickly, even at the expense of deferring (and possibly compromising) the questions as to what happened and why. Lots of simple tow equipment and helicopter ambulances seem like natural tools. In fact the ubiquitous policeman could do more with a nylon tow rope than with his gun or notebook; I suppose he has the authority to commandeer cars in the public interest.

The traffic light comes to mind: a useful device to promote the flow of cross traffic when the density on two roads is at a certain level. It isn't the best device for all levels of density and for all purposes. It is used indiscriminately by the million for purposes deliberately inimicable to traffic flow. It should be harder to get a traffic-light license than a liquor license — the level of knowledge of a medical license sounds appropriate. And since they never seem to disappear, we need a man with the authority and responsibility to collect and junk unnecessary ones as if they were slot machines.

The situation at most light-controlled intersections — including the legitimate ones — is made unnecessarily bad by the fact that left turns are permitted. This operation has the potential of snarling two lanes of traffic and sometimes snarls all lanes. Why it is ever permitted except where
traffic is negligible, I don't know. Requiring that the left-turner circle to the right, when that is possible, seems like a reasonable sacrifice for him to make for the common good.

The situation regarding school zones has some of the elements of No Death Day — notably high emotional content and little reflection. Most of the time that vehicles spend crawling through upward of one hundred thousand school zones is useless ritual. Most of the time that children are at school they are required to be inside the school in fixed groups. Most of the time they are at school and outside the building they are in supervised play areas (fenced, or they should be fenced). They are safer from vehicles than at any other time in their waking lives no matter how fast the vehicles are moving. The time they need extra protection is during the periods they are in transit between home and school, so this is the problem to be solved. It is probably soluble in ways more useful to the society than posting school zones with extraordinary speed restrictions. Perhaps if the energy and money now spent on superfluous traffic lights were spent on school-crossing-in-use lights, the restrictions on the speed of vehicles could be confined to times when they could do some good. This is analogous to the railroad-grade-crossing signal, but a little better because the child has emergency capabilities not available to the train. The grade-crossing signal isn't a perfectly foolproof system but it is superior to the slow-for-grade-crossing sign. The motorist
knows when the danger is specific and imminent.

I have argued that safety is a secondary matter from the viewpoint of society, which needs great mobility irrespective of safety — within wide limits. Safety is a nice thing to have in specific cases, but one can easily overdo its use — like in using our wonder drugs, one must not try to kill all the bugs. However, it is a legitimate personal concern for the individual and he may help himself to things which will ameliorate the dangers. He is unfortunately confused about some of the most useful measures available to him. For instance, he tends to regard seat belts (or, better, shoulder harnesses), crash helmets, and roll bars as the trademarks of a hare-brained driver, I suppose because they were invented for use in transparently dangerous situations. Actually they are required in transparently dangerous situations at the insistence of the conservative driving element. The representative driver should become aware of the fact that driving even in the presence of his peers is dangerous enough to take his life, and that some of these simple devices may save it for him. In fact they are probably more useful to him than to the racing driver, because they are more likely to be effective in a low-speed crash than in a high-speed one. And even 20 mph has strong homicidal possibilities in a crash, for if the car loses this 30 feet/second speed almost instantly, the driver will travel three feet during the next one-tenth of a
second, which is far enough to take him through the windshield or out the door. Their general use might reduce traffic deaths to half the present number.

The automobile manufacturers have not worked very hard at designing and stressing safety features, I suppose because one can't get the buyer too excited about such things unless one first stresses the hazards — which sounds like an unattractive way to induce people to buy and use automobiles. While I suspect the manufacturers' motives may be somewhat crass, the fact is that they have worked hard to place in the individual's hands a device (albeit a dangerous one) which makes him extremely mobile. For contrast, the constructive works of some organizations with impeccable motives are not always so obvious. The National Safety Council, for instance, may do all sorts of unpublicized good works. The only thing they are generally known for is their activity as spoilsports. On the formal holidays of our society they stand about declaiming the number who will be killed by automobiles, the implication being that if we would only be good children this wouldn't happen. I question the value of these warnings. They don't even have the professional merit of being difficult to make!

On the other hand, organizations like the National Safety Council could put on campaigns for shoulder harnesses, crash helmets, or any equipment which they feel is useful, aimed either at the individual or the manufacturer. Most campaigns
now are based on nonsense premises, such as cut-down-the-
horsepower-and-save-lives. These are groping attempts to
place an absolute limit on speed, which we have argued is a
strictly antisocial concept. Moreover, pretty silly attempts:
it is surprising how few horsepower it takes to go 100 mph
if you design for it. The principal function of lots of
horsepower is to increase maneuverability, which may either
increase or decrease safety in a specific instance, but which
in general we should presume increases it; there must be some
net advantage in having vehicles which will more often do
what you want them to do when you want them to do it. On the
other hand, who is urging the manufacturers to invent more
advanced signaling equipment? The brake-operated rear light
has been standard equipment for a third of a century, the
turn indicator for a tenth of a century. Is that all?
Automobiles make other speed changes which it would be useful
to know about, as when the foot is lifted suddenly from the
accelerator or the transmission downshifts. How about a
slowing-up light? Are there any utilities for car-borne
radio, television, and radar, other than entertainment?

The motto of everyone concerned with traffic should be
"Keep It Moving." The odds are that no matter what one does
to that end, something good will come of it. The odds are
that whatever one does which is contrary to the motto will
have a detrimental effect in the large.