OVER-ALL HIGHWAY ACCIDENTS ON GENERAL DECLINE

Highway accident rates in the United States have shown a gradual decline for many years. There have, of course, been some temporary ups and downs and nearly everyone likes to take credit for the downs. In a state safety conference in another part of the country some years ago, many speakers commented on the 10 percent reduction seen in accidents in that state the previous year. A spokesman for the driver education fraternity said, "We have finally gotten through to them."

The spokesman for the state police department attributed the change to strict speed control. The motor vehicle administrator claimed that intensive enforcement of license suspensions and revocations was responsible. The highway department representative pointed out the strong program the previous year in removing trees from the roadside.

The following year the accident count was up again—nobody claimed the credit.

Once in a while there is a substantial one year change—like the introduction of the 55 mph speed limit in 1974-1975, but most short-term changes are really quite difficult to explain. Perhaps a combination of all of the above actions was responsible, but maybe there was some underlying social phenomenon—a long strike in a major industry, a recession, a change in the draft law—which really "caused" a change in driving patterns.

But over the long haul most accident and fatality rates in the U.S. have continued to decline. It seems to me that the real credit must go to the highway designers and builders. More than 20 percent of our total traffic is now on interstate-quality roads, along with more than 50 percent of the tractor-trailer traffic. Nearly all highways have upgraded their guardrails over the past 20 years and roads that carry substantial traffic at high speeds, generally the state trunklike systems, have had tree and pole removal programs to provide a relatively clear roadside. The fatality rate (deaths per 100 million passenger miles) dropped from 5.3 to 3.3 between 1969 and 1978. This upgrading process is not finished but it is well on its way.
While it is true that things have been "getting better" for some time, there is a good chance that fatality rates will increase again in the near future; and that the means of preventing such an increase may also lie in the hands of the highway engineers. Recent NHTSA announcements indicated that largest truck (mostly combination vehicle) fatal accidents have risen more than 40% over a period of four years.

Newton's law provides the explanation for this increase in fatalities, because deaths occur mainly in the "other vehicle" in a truck-car crash. Indeed, in two-vehicle crashes in the U.S. between combination vehicles and passenger cars during 1978, 60 passenger car occupants died for each truck occupant who died. The ratio of damage to the vehicles is often of similar magnitude, with the truck suffering a bent bumper compared to a totalled sedan.

The rate of increase of passenger car travel has slowed the past several years, but commercial traffic has continued to increase. Figure 1
ANALYSIS OF TRUCK-CAR ACCIDENTS

There is a lot of variability in truck accident involvements in the U.S. They are least frequent in coastal areas and most frequent toward the center of the country. Figure 2 shows that Indiana is on the high side, with an actual value of about 13 percent. In Wyoming, 25 percent of the fatal accidents in 1978 involved tractor trailers.

The national increase is shown in Figure 3, which plots the number
of fatal combination-vehicle accidents by month for a five-year period. The general slope is of the order of 1 percent per month, but the winter/summer differences are striking. The reason is that fatal truck accidents occur when the passenger car population is high, and during the summer cars are most abundant on the roads that trucks travel. This ought to suggest that a way of reducing truck fatal accidents would be to get the cars off the road. The variation with time of day is similar—the peak occurring in the afternoon when passenger vehicles are more likely to be on the roads with trucks.

Table 1 shows the number of these fatal accidents by road class over a period of five years, as taken from the National Highway Traffic Safety Administration (NHTSA) Fatal Accident Reporting System (FARS) files. Data for 1979 in this table were incomplete at the time of writing, but the distribution over all five years is clear. Nearly two-thirds of the accidents occur on U.S. and state routes other than Interstates. With more than half of the truck travel on Interstates, the overinvolvement on other trunklines is obvious.

### TABLE 1
Combination Vehicle Fatal Accidents in the U.S. for 1975-79: Frequency by Road Class

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### HIGHWAY SAFETY COUNTERMEASURES
Highway safety countermeasures may be thought of in two classes: (1) those which will reduce the severity of the crash, and (2) those which will reduce the likelihood of the crash. With regard to severity reduction, NHTSA and the Bureau of Motor Carrier Safety have been working toward more effective underride guards, and currently there is some activity toward enhanced protection of truck occupants. On the highway side, severity-reduction measures would include variable sizes of sand barrels at obstacles, so as to protect vehicles of different size.
For the most part, gains in the reduction of injury and fatality in crashes between vehicles of disparate size must come from reducing the likelihood of the accident. One might consider such countermeasures in three classes:

(1) Education—training drivers in accident avoidance;
(2) Conspicuity enhancement—making it easier to identify other vehicles and thus avoid them; and
(3) Separation of the conflicting vehicles in time or space.

Historically we seem to approach most problems in this order. In the early days of the automobile, pedestrians were educated to stay to the side of the road, and car drivers to "watch out" for pedestrians. Then cars were equipped with brighter headlamps, and pedestrians were expected to wear white clothing. And when the problem got worse, sidewalks, pedestrian overpasses, and other positive separation methods were introduced. The present evidence of an increase in truck-car accidents suggests that some positive separation steps may be in order. We have heard that the total amount of traffic in the U.S. is going to continue to increase, and that commercial travel will increase even faster than personal travel. Our lifestyle may demand a further increase in commercial traffic on those roads that currently have the worst truck-car accident problems—the non-interstate-quality U.S. and state trunklines.

Some approaches have already been made toward separation. In New Jersey, for example, the Garden State Parkway and the New Jersey Turnpike parallel each other over much of their length. The Parkway is limited to passenger vehicles, and while the Turnpike is not restricted, it tends to be mainly populated by trucks. There is some natural selection, of course, in that truck operators may choose not to travel during a passenger car rush hour, simply to improve their productivity.

CONCLUSION

I wish I had an easy solution to an anticipated increase in crashes between vehicles of disparate size over the next few years. Restrictions on either personal or commercial travel are abhorrent to most of us since we want to be free to travel when and where we wish in this country. But in 1979 nearly 10 percent of all traffic accidents in the U.S. involved a tractor-trailer, and this proportion is rising about 0.5 percent each year. We seem to be getting to the point where the problem is too large to be solved by either education or enhanced conspicuity. Some sort of physical separation is needed in either time (by restricting the times at which trucks and cars can travel together) or space (by identifying particular roads as being for one or the other).
I believe that most of the decrease in U.S. accident and fatality rates over the past fifty years has resulted from highway improvements, and that those in the highway engineering fraternity deserve the credit. But now there is a challenge to develop new traffic-control methods that will minimize the unwanted interactions of vehicles of different sizes. The central states, Indiana included, are the places where truck-car accidents have been most numerous, and I challenge you to help provide the solution.