16 Vision for a safer tomorrow

Introduction

Traffic crashes have been harming enormous numbers of people for over a century. Much of this book is devoted to describing countermeasures that have helped prevent the harm from being even greater. Countermeasures in place today reflect ongoing evolution based mainly on building upon concepts originating in early decades of the twentieth century. This has resulted in what one might call a traditional approach, some variation of which is in place in all countries with vehicular traffic. Which components of this traditional approach are emphasized can make a dramatic difference to casualties (Chapter 15). The discussion below uses US experience and data, but the general themes are applicable to any jurisdictions.

The traditional approach has fostered attitudes that limit expectations. Despite the numbers of injuries and deaths, traffic safety is not generally viewed as a component of public health. Enormous casualties are largely accepted as normal, inevitable, and not particularly newsworthy. There is a public perception that crashes are due mainly to fate and bad luck, encouraging the notion that not all that much can really be done to prevent them. The still all too widely used word *accident* reflects and encourages such beliefs. Claims that something can be done often focus on factors, like vehicle design, which have little potential to make much additional difference.

Successes and failures are judged relative to well-established norms. There is acceptance that the best that can be done is slow ongoing progress. Risk reductions of a few percent are heralded as major achievements, which they indeed are. A measure that reduces risk in traffic by one percent prevents the deaths of more than 10,000 people in the world per year. It prevents the death of more than one person in the US per day. Any new product or process suspected of causing far less than one death per day in the US would generate massive headlines.

Efforts to reduce the toll from traffic crashes are conceived in terms of refinements and minor incremental improvements to present policies. However, even progress at a somewhat greater rate than has been achieved hitherto does not keep pace with the growth in vehicles. In the US the absolute number of people killed in traffic has actually increased from 39,250 in 1992 to 42,815 in 2002. Worldwide, deaths are increasing at a much greater rate than this.

I believe modest changes to a number of components of the traffic safety system currently in place can, in combination, lead to major reductions in harm. A breakthrough is achievable. It does not require major expenditures, although

it does rely on new technology. Taken in its entirety, I believe the public would welcome the breakthrough I am recommending. Indeed, it can succeed only if the public does welcome it. The key to progress is a different relationship between those at risk and the institutions in place to protect them. Unlike other aspects of public health, those at risk in traffic are often hostile to the institutions aimed at protecting them.

Personal vehicles provide personal freedom, but harm many of those enjoying that freedom, and others besides. An effective approach to reducing this harm must start from the interests and perspectives of individual road users.

The two most important factors

The traffic safety research presented in the previous 15 chapters, and my more than 30 years of traffic-safety research, convince me that the two factors that overwhelmingly determine an individual's risk in traffic are:

> 1.   The individual's behavior.
>
> 2.   The behavior of other road users.

While an individual's behavior is 100% under his or her control, the behavior chosen is much influenced by social norms and public policy, especially traffic law. The role of traffic law is diminished because it attracts insufficient public support, and indeed is often the focus of public hostility. Public support for enforcing traffic law would increase if far more emphasis were placed on the second factor, the extent to which risk in traffic is due to other drivers.

If a driver is killed in a single-vehicle crash, that death involves only the driving of the deceased driver. The crashes killing all other road users involve actions of a driver other than the person killed. If a driver is killed in a two-vehicle crash, then this death involves the actions of the deceased driver and the actions of the other involved driver (who may also die). The deaths of all passengers and pedestrians involve the actions of some driver. Table 16-1 shows that in the US in 2002, only 31% of fatalities involved the driving of only the person killed. The vast majority of fatalities (69%) were in crashes in which a driver other than the person killed was involved. In countries other than the US the fraction of all road users killed that involve a driver other than the person killed is even larger. The fraction is especially large for less motorized countries.

Over 29,000 Americans were killed in 2002 in crashes involving actions of drivers other than the person killed. Of these, 1,769 were non-driving children under 14. An average of more than one child per day is killed while walking or riding a bicycle. Overwhelming, no alcohol is involved in such crashes. The risk families face from the actions of other drivers towers over any other risks they face. If this were better publicized, I believe the public would be more inclined to support effective measures to reduce risks from traffic.

Table 16-1. The 42,815 traffic fatalities in the US in 2002 separated according to whether or not a driver other than the person killed was involved.

persons killed	deceased is only driver involved	driver other than deceased involved
drivers in single-vehicle crashes	13,399	
drivers in multiple-vehicle crashes		13,150
passengers		10,571
pedestrians		4,875
bicyclists		662
others		158
total number of fatalities	13,399	29,416
percent of all fatalities	31.3%	68.7%

The issue of second-hand smoke played an important role in reducing smoking. The argument that smokers should not damage the health of their children, co-workers, or fellow diners proved persuasive. While there is uncertainty about the extent of harm from second-hand smoke, there is no question that 1,283 children under 14 died as passengers in vehicles in crashes involving the behavior of drivers. Furthermore, smokers themselves suffer the harm from smoking to a far greater degree than reckless drivers themselves suffer the harm from reckless driving.

Air travelers are willing to have their luggage searched even though they know it does not contain a bomb. They appreciate that the only way someone with a bomb can be stopped is if everyone is scrutinized, and they willingly subject themselves to intrusive and sometimes embarrassing searches. Yet other road drivers threaten their lives, and those of their children, far more than bombs on planes do. A major advance in safety will occur if the public realizes that more effective monitoring of other drivers provides them far more protection than searching luggage. If other drivers are to be monitored, then a policy of monitoring all drivers must be accepted. Later we address simple changes that can make drivers support such a policy.

The extraordinary safety of commercial aviation

In 2002, there were zero deaths on US scheduled airlines,[1] but 42,815 deaths on US roads. (Roads provide about 9 times as many passenger miles as airlines.)[2] Intuitively, flying is inherently much riskier than road travel. Many people are frightened of flying, but almost no one in a motorized society is frightened of being a passenger in a road vehicle. The dramatically greater safety of the riskier flying mode occurs for two reasons. First, the primary focus is on avoiding crashes, and second, pilots adhere strictly to established driving rules.

Avoiding crashes, rather than surviving them, is the primary goal

Weight is an overriding aircraft design consideration. Some airlines do not paint their aircraft to avoid carrying the additional weight of the paint, even though unpainted aluminum is more expensive to keep clean. Weight has a major impact on aircraft speed, range, and passenger-carrying capacity. As a result aircraft design adds little in the way of specific crash-management structure, and includes only modest structural safety margins.

Moving people through the air at high speeds in a flimsy vehicle precludes any debate about whether the primary safety goal should be to avoid crashing or to make it safe to crash. Airline safety focuses overwhelmingly on avoiding crashing. Crashworthiness is not ignored, and aircraft contain many features to increase safety during and after crashes. Research is always ongoing to increase survivability when airliners do crash. However, such efforts never divert attention from the paramount goal of avoiding crashes.

This is in sharp contrast to the automotive case in which crashes are often seen as inevitable, thereby assigning top priority to the quest for measures to reduce their consequences. Vehicle design changes introduced over the decades have reduced the risk of death in a crash by about 20%. Occupant protection from wearing a safety belt reduces fatality risk by 42% (safety belt plus airbag by 47%), so a belted driver in a modern car is less than half as likely to die as a driver in a 1950 car of similar mass in an identical crash. This is a major achievement that has saved many lives. Further modest reductions in the risk of death when a crash occurs are always possible from further refinements in vehicle crashworthiness and restraint design. However, it is now time to accept that this phase is largely complete. There do not appear to be any practical and acceptable means to reduce risk much further when a vehicle of given mass and size crashes at a given speed. It is counterproductive to keep devoting excessive attention to measures that have the potential to reduce the risk of death in a crash by no more than an additional few percent. This would still leave over 40,000 deaths per year in the US. In sharp contrast, crash reduction offers large benefits as long as crashes remain a problem.

There is, however, one area of survivability in which substantial gains are still possible, namely, increasing belt wearing rates. This is not a vehicle design factor, but a behavioral and law enforcement factor.

Air travelers rarely ask, "Which aircraft is safest?" yet I am often asked, "Which vehicle is safest?" When air crashes do occur, they are likely to be related to vehicle design or manufacturing problems. Such factors are of almost no consequence in road safety. It is important for road travelers to understand more clearly that it is the safety of the traffic system, and particularly the way the vehicles are driven, that is crucial, not how the vehicles perform when they crash.

Driving by obeying rules, not by experience

Commercial pilots adhere to rules that incorporate knowledge accumulated from many professional disciplines. They are guided by much more than their own personal experience. Pilots do not learn by going to the limit, and when something almost goes wrong, backing off a little. Road drivers use their personal experience to choose what they think is a safe speed or safe following distance. A large part of the basis for their decision is that prior similar behavior has not led to a crash. Their understanding may be augmented by experiencing crashes and near crashes. While currently normal for road travel, such processes are clearly unacceptable for flying.

Traffic law should reflect accumulated knowledge from many professional disciplines in a manner somewhat parallel to the rules for flying. However, unlike the air case, traffic law is routinely violated, perhaps many times per trip by most drivers. The social norm incorporates such violations as acceptable to a degree without parallel for other laws aimed at protecting the public.

Enforcement

There are two major problems that render traditional traffic law enforcement relatively ineffective. First, it provides a low, and capricious, probability of detection. Second, the public is justifiably suspicious about the motivations behind traffic law and its enforcement.

Low and capricious probability of detection

Traditional enforcement of traffic law involves police officers, usually in police vehicles, detecting the speeds of vehicles or observing the behavior of vehicles in traffic. Despite the considerable cost of traditional enforcement, it can monitor only a small fraction of traffic, so that the probability that any specific infraction is detected is exceedingly low. Receiving a traffic violation ticket depends far more on whether a police officer is present than on the behavior of the driver. Still, many tickets are given. Those who receive them generally consider themselves victims of being in the wrong place at the wrong time, rather than admitting to themselves that their behavior posed any safety threat. They are too often correct. This does not endear traffic law enforcement to the public.

Much of the harm in traffic is due to drivers who routinely and egregiously violate traffic law. Only a miniscule fraction of their violations are detected. A driver would almost certainly have to be a routine violator to receive, say, five citations in a two-year period. The capricious nature of the present system forges an inappropriate and harmful bond between average citizens and high-risk drivers. Average citizens often regard frequent violators to be just like themselves, but with worse luck, rather than the ongoing threats to them and their families that they in fact are.

Traffic law must not be used to raise revenue

Apart from its role in ensuring efficient traffic, the sole purpose of traffic law should be to prevent harm. One of the most unfortunate developments worldwide is that traffic law is often used for a quite different purpose – to raise revenue. Using it for such a purpose brings it into disrepute. Instead of the public welcoming traffic law as protecting them, they consider it an illegitimate tax. Those forced to contribute often feel that a process no more rational or fair than a lottery has selected them. Some racial and ethnic groups view the selection process to be biased against them. Everyone sees drivers commit extreme violations of traffic law with impunity, while others behaving little differently from the average are severely fined. To make matters worse, there are cases of laws motivated for purposes other than traffic efficiency or safety, including *speed traps* (unreasonably low speed limits) enacted solely to raise revenue. Traditional traffic law and traffic law enforcement practices have created a recipe for failure that I believe has rendered relatively ineffective the one remedy that has the potential to spearhead a safety breakthrough.

Enforcement using newer technology

New technology offers the way out from deficiencies of traditional enforcement. The technology can produce dramatic reductions in harm, but only if it is introduced in ways that the public welcomes. Below I first describe the technology, and then suggest how I believe it can be integrated into an overall policy package that would find public support.

   A number of automatic enforcement technologies have been developed, and are in use to some degree in many countries, including the US, UK, Canada, Australia, New Zealand, and a number of countries in continental Europe. Some of the technologies are completely automatic, while others enable police to perform enforcement work more productively than in manual enforcement. Technology to measure following headways and issue tickets for illegal tailgating has been developed and field-tested in Israel.[3] However, the main applications of new technology have been in detecting violations of speeding and traffic light laws.

Photo radar. This is a system designed to automatically detect vehicles violating speed limits. It includes a camera and attached radar speed measuring device. When a vehicle is measured violating the speed limit, the system photographs the driver and the license plate. The registered owner of the vehicle then receives a traffic ticket in the mail. Photo radar may be operated from marked or unmarked police vehicles. An evaluation of results from studies of various automatic speed detection systems found that they reduced crashes by 19%.[4] Another study found a photo radar program reduced highway mean speeds by 2.8 km/h.[5] Substituting $\delta v = -2.8$ km/h into Eqn 9-1 (p. 211) indicates that such a speed reduction would reduce fatality risk by 17%.

Red-light cameras. These are systems designed to automatically detect vehicles entering intersections after the traffic light has turned red. They have four advantages over photo radar. First, manual detection of red-light violations is less efficient because they are less frequent than speeding. Second, manual enforcement places police officers at greater risk than manual detection of speeding. Third, it already finds more public support.[6] Fourth, its technical implementation is facilitated because outputs from the traffic-light signal controller are available for input to the red-light camera system.

Cameras record images of an offending vehicle and the surrounding scene, together with vehicle speed, duration of the yellow signal, and how long after the red signal the vehicle began to enter the intersection. A second photograph may be taken to verify that the vehicle proceeded through the intersection on the red signal. A review of the literature found that most evaluations reported that red-light cameras led to an increase in rear-impact crashes.[7] It is possible that this might happen because lead drivers suddenly realized that a red-light camera is present, while the following driver did not. If so, the effect might disappear if cameras were generally expected (compare with Fig. 8-3, p. 186). What is crucial is that the review found that even with these extra rear impacts, injury crashes still declined by 25-30%.[7]

Advantages of automatic monitoring of driving

The new technologies are still in their infancy. They offer enormous advantages over manual monitoring. Assigning skilled police officers to monitor traffic is an ineffective use of valuable public resources. What humans do poorly, technology can do well at a tiny fraction of the cost. Automatic monitoring provides the following advantages.

High probability of detection. It is probability of detection, not severity of punishment, which is far more effective at changing behavior. Most would agree that a hypothetical on-board device that administered an instant and certain ten cent fine every time a speed limit was violated (and the same amount per additional second of violation) would have a vastly more dramatic effect on speeding than does the possibility that speeding might lead to death. New monitoring technologies do not provide such instantaneous feedback, but they provide the potential to move a long way in the direction of near-certain feedback a day or so after the offense.

Objectivity and completeness. Inanimate devices are immune from charges of caprice or bias. At a given site, all vehicles are monitored. Anyone receiving a citation will have little basis for thinking that others behaving in the same way did not also receive one. The photographs produced by automatic detection preclude most of the challenges to evidence provided by customary enforce-ment. Automatic detection is on duty 24 hours per day. Much of the most severe harm from crashes occurs at times when traffic volume is low, while traditional enforcement is more focused on times when traffic volume is high.

It is plausible that advances in mass production and information technology would eventually make it feasible to detect a large fraction of all the violations that currently occur. The *spillover effect* will lead to lower speeds on non-monitored roads adjacent to monitored roads, and, in general, more overall conformity with speed limits.

Drunk driving. Traditional enforcement detects about one drunk driver for every 2,000 trips driven by drunk drivers. Apart from sobriety checkpoints, a police officer must observe improper driving before testing for alcohol. Drunk drivers take higher driving risks than sober drivers – it is the behavior resulting from alcohol, not the alcohol itself, that causes crashes. Automatic detection is likely to record large numbers of speeding and traffic light violations by a drunk driver well before there is any realistic chance of a direct manual-enforcement citation for drunk driving. The most effective other countermeasure, the sobriety check lane, is expensive and inconveniences all drivers. Law-abiding drivers are stopped, and can be required to provide a breath sample, arguably a far greater privacy violation than being in the lens of a camera that records pictures only of lawbreakers. One of the strongest benefits of automatic monitoring of traffic (unlike airline security) is that it does not delay, inconvenience, or embarrass any driver who is not breaking the law.

A number of related policy changes are necessary to make automatic monitoring effective and acceptable. I believe that these changes, taken as a complete package, can attract popular support. Automatic monitoring can provide the catalyst for the other important changes.

Driving is a public, not a private, activity

An already implicitly accepted principle must be even more openly embraced. The principle is that driving is a public, not a private, activity. Privacy must be sacrosanct for private activities, but not for public activities. There is already universal support for massive government intrusion into matters relating to driving that would be intolerable for private activities. One may not drive at all without government permission in the form of a license. The permission can be revoked, even administratively without court process. It is none of the government's business if one is drunk in one's home, but few claim that it is nobody's business if you are drunk while driving. Police are permitted to monitor vehicles, and stop drivers suspected of violating traffic law. Traditional enforcement already uses technology, in the form of radar to measure vehicle speeds, and breathalyzers to measure alcohol. Traditional practices are rarely criticized as violations of privacy. Yet privacy arguments emerge to oppose using technology to better enforce existing traffic law.

Such opposition seems inconsistent with the widespread acceptance of invasive scrutiny of our persons and luggage by manual and electronic means

before boarding an aircraft. Throughout the flight, the aircraft's controls are automatically monitored, as are its altitude, speed, and direction, yet no one claims that this should not be done because it violates the crew's privacy. It cannot be too strongly stressed that the behavior of other road drivers poses a far greater risk to law-abiding citizens than any risks they face when flying. Drivers running red lights kill about 850 people annually in the US.[7] The people killed are not usually occupants in the vehicle running the red light, which is frontally impacted, but those in the vehicle legally entering the intersection, which receives a far more lethal side impact.

Closed circuit television monitoring in stores is widespread. The public does not object even though the risk it reduces is the loss of someone else's property. It seems the public is happy to be photographed rather than pay modestly higher prices to cover increased shoplifting costs. Although government does not do the recording, crime-scene pictures that incidentally include innocent shoppers may be provided to police.

Automatic monitoring of traffic requires that only law violations be photographed. Safeguards could be in place to insure that data for vehicles driving legally would not be retained. Indeed, there may be no need for any human to see the photograph of the violation other than the recipient of the ticket.

Opposition to automatic monitoring of drivers on grounds of privacy should be rejected on three counts. First, driving has never been interpreted as a private activity. Second, video surveillance is routinely accepted to reduce far less harmful behavior. Third, the enormous harm drivers impose on other road users overwhelms claims of privacy while driving.

Policy and automatic monitoring

The benefits of automatic monitoring can be available to the public only if the public welcomes such monitoring as an effective approach to a massive problem. This is unlikely to happen if there is even a suspicion that it is just another revenue-raising scheme. Automatic monitoring in the US and the UK is already generating vociferous hostility on such grounds. Traffic safety must be conceived as a major public health problem which government has an obligation to address. Public health problems are not sources of revenue, but one of the most legitimate justifications for government expenditure.

The present system, which punishes the typical citizen, is never going to attract the level of public support that is crucial to dramatically enhance safety. The aim must be that a typical citizen should never have to pay a traffic fine. Infrequent violations should not be punished. Nearly all drivers occasionally exceed speed limits by modest amounts, or enter intersections somewhat late. An isolated violation should generate a gentle letter explaining that the purpose of traffic law is to prevent harm, and explain that stricter compliance in the future will help achieve that goal. A reminder of how much harm occurs in traffic might be included. A second offense within a short time period should

generate a stronger letter. Information technology makes it easy to provide the individual's entire violation history with each letter. Only offenses exceeding some specified rate of occurrence, or extent of violation, would result in escalating fines and other criminal sanctions.

Automatic enforcement associates the traffic law violation with the vehicle through the vehicle license plate. Law changes would be required to make the vehicle owner more responsible for its use. The ticket is sent to the registered owner of the vehicle. Cases when the owner was not driving would likely lead to safety-enhancing discussions between owner and driver. More serious driving offenses would focus directly on the driver, and be handled by the criminal justice system in ways similar to the present.

Automatic enforcement can essentially eliminate habitual speeding. If frequent speeding occurs, it would soon lead to involvement with the criminal justice system. Under conventional enforcement, those punished generally continue with relatively unchanged driving behavior. With automatic enforcement, unchanged behavior will be quickly detected. Continued violations will lead to license revocation, and with automatic detection, unlicensed drivers are far more likely to be detected if they drive. The most likely effect is that formerly speeding drivers will become legal, safer drivers, the real goal.

To date the world has no experience of cases in which speed limits are rarely exceeded. As experience with automatic speed detection is accumulated, I believe we could set higher speed limits on certain roads and still end up with far greater safety than provided by the present lower speed limits and the patterns of violations that accompany them. So a possible outcome of automatic detection might be law-abiding drivers traveling safely at higher speeds.

What should be done with fines

In order to make it abundantly clear that the purpose of traffic law is to reduce harm, the money paid in fines should be kept in a separate account. At some date, perhaps just before the end of the calendar year, the total should be divided equally among all license holders, and distributed in the form of a check. The amount would be modest, likely around ten dollars. It would come with a letter from, say, the Secretary of State, stressing that the entire amount paid in fines by drivers was being returned to drivers. The letter would express the hope that we would all work together to insure that next year the amount would be even smaller, and that ideally the amount should approach zero as we progressed towards the goal of no driver committing offenses that exceeded the threshold leading to a fine. The goal of traffic law is not to apprehend and punish violators, but to reduce harm by preventing violations.

Costs and benefits of the new approach

The major government cost of the new approach is the loss of revenue from fines. Added to this is the capital cost of the automatic monitoring system, maintaining it, software development, and mailing and administrative costs, etc.

However, major benefits will flow from achieving the goal of reducing crashes, which cost the US $231 billion per year. Any measure that reduces this amount by even a small percentage will pay handsome dividends. I believe the reductions would be not small, but substantial.

Raising the probability that a traffic-law violation will be detected to near certainty will reduce traffic law violations to near zero. Based on the material in Chapter 13, removing law violations would reduce the total number of crashes by about 50%, severe injury crashes by much more, and fatal crashes by yet more. I suspect that the estimates are in fact low. When a crash occurs there is often no evidence beyond the testimony of the driver who crashed, so that many law violations prior to crashes are likely to go unrecorded. The issuance of a traditional traffic citation reduces a driver's risk of involvement in a fatal crash by 35% in the month following the citation.[8] One can but speculate what the effect of an automatic citation for every infraction might be.

Other changes

While the most specific reductions in crashes are achievable from automated law enforcement, other changes that impact social norms can make important contributions. Driving is one of the most responsible human activities. Compared to any other activity of a typical citizen, driving is vastly more likely to cause death. The steps towards acquiring a full license should become important rites of passage to full citizenship and adulthood. Mass media glorification of the use of vehicles in ways that threaten life should generate the level of public outrage that has culminated in other self imposed and externally imposed restraints. The US Federal Communication Commission imposes large fines on radio and television stations for broadcasting material it considers indecent. Lives would be saved by similar policies prohibiting the positive portrayal of driving likely to kill. Such prohibitions should be applied also to vehicle advertising portraying irresponsible driving.

Suggestions of restraints on program content or advertising are often opposed as violations of First Amendment rights guaranteeing freedom of speech. As in the case of the privacy arguments against automatic enforcement, such claims ignore the innumerable voluntary and statutory restraints currently in place on what is broadcast in such areas as decency and cigarette advertising. As there are already constraints in place in response to many pressures, it is worth considering having some to prevent people from being killed in traffic.

There is unquestionably tension between human pleasures and safety. Fast driving, smoking, consuming large quantities of alcohol and other intoxicants, and eating cholesterol-rich high calorific food are activities enjoyed by many. However, they are pleasures that come with a cost. People have been intentionally forgoing many of them to reduce the risk of unwelcome consequences. One of the largest improvements in public health is due to reductions in smoking. It did not occur because smokers found smoking unpleasant. The hope is that

parallel reductions in harm from traffic can arise because people forgo the pleasures of illegal fast driving. As with smoking, people who do not themselves desist can be constrained from harming others by laws prohibiting their behavior in public.

A pedestrian-crash default

A default regarding responsibility when a vehicle strikes a pedestrian could generate reductions in harm well beyond the reductions in pedestrian casualties. There is already a well-established default for another crash type, the rear impact, for which the following driver is presumed to be legally *at fault*. There are compelling reasons why this should be so. Drivers should feel free to slow down or brake in response to traffic situations in front of them without having an additional burden of worrying about the vehicle following theirs. The obligation of the following driver is clear. Essentially regardless of what the lead vehicle does, a following driver is not entitled to crash into its rear.

I believe establishing a default responsibility in pedestrian crashes could provide important safety benefits, although the basis for assigning the responsibility is quite different from the rear-end crash case. Currently if a pedestrian steps or runs off the sidewalk into the path of a vehicle whose driver is driving within the speed limit and exercising typical care, the pedestrian will be judged to be at fault, and the driver will be judged to be not at fault. This reflects the fact that pedestrians are required to obey the law and exercise good judgment, and not step in front of vehicles. The pedestrian and driver are presumed to have comparable responsibility to obey the law, and if one does and the other does not, then the law-breaker is judged to be at fault and the law-obeyer to be not at fault.

This symmetric arrangement does not encompass a crucial asymmetry. The driver is in control of a massive vehicle traveling at high speed that can cause great harm to pedestrians while providing enormous protection to the driver. On the other hand, pedestrians have no such protection. This huge asymmetry in risk should be balanced by a corresponding asymmetry in legal responsibility. It should be specified that drivers must not crash into pedestrians, whatever the pedestrians do, just as they are not allowed to crash into vehicles they are following. The explanation that it was not the driver's fault but the fault of the five-year-old child, the elderly pedestrian, or the blind pedestrian, would become vastly less acceptable than it is today.

In proposing that the driver be presumed to be at fault, I am not suggesting that drivers currently are casual about hitting law-breaking pedestrians. Currently drivers normally exercise increased care when pedestrians are near. The goal is to further increase this care and sensitivity. The law is a potent educator. Formally defining pedestrian safety to be the overriding responsibility of the driver has the potential to generate greater driving care, and driver responsibility in general.

Summary and conclusions

A breakthrough in road traffic safety can be achieved by adopting the same two central principles that led to such outstanding safety in commercial air travel. First, the primary goal must be to prevent crashes, not to make it safer to crash. Second, drivers must follow rules based on inputs from many professional disciplines, rather than relying mainly on what they have learned from their personal experience.

Over 29,000 Americans, including 1,769 children under 14, were killed in 2002 in crashes involving actions of drivers other than the person killed. The risks families face from the actions of other drivers tower over any of the other risks that concern them. If this were better publicized, the public would be more inclined to support effective measures to reduce traffic crashes.

The key to reducing crashes is obeying traffic law. Two deficiencies of traditional traffic-law enforcement have crippled its effectiveness. First, it is seen as capricious and unfair, fining many average citizens for minor offenses while other drivers committing egregious offenses go undetected. Second, fines are seen as revenue-raising schemes rather than good-faith efforts to enhance public safety. For traffic safety policy to be successful it must have only one goal – protecting the public. The public must recognize and support this goal.

New automatic detection technology, if introduced as a component of changed safety policy, can dramatically reduce harm in traffic. The new technologies include photo radar and red-light cameras, which provide objective evidence, including photographs, of vehicles violating speed limits or running red lights. The registered owners of vehicles photographed violating traffic law receive automatically generated traffic tickets in the mail.

I believe that the public would welcome the widespread use of such technology to effectively enforce traffic law if it were the centerpiece of new policy containing all of the following four components:

1. Traffic law would have only one purpose – to prevent crashes and the injuries and deaths they produce. This must be the policy, and the public must know and accept that this is the policy.

2. Automatically-detected minor violations would receive no punishments for first, or infrequent, offenses. More frequent, and more severe, violations would be subject to escalating fines, and increasing criminal sanctions.

3. All traffic fines would be kept in a separate account, and distributed equally to all license holders as an annual bonus. This would come with an upbeat letter, expressing the hope that the small bonus would be even smaller next year as we all worked together to reduce the number of drivers exceeding the fine threshold to near zero.

4. Law changes would make the registered owner of the vehicle responsible for responding to traffic tickets.

These proposals would cut traffic harm in half. They would involve public expenditure, mainly through loss of revenue from fines, and the purchase and operation of technical equipment. Given that traffic crashes cost the US $231 billion per year, public expenditures that reduce crashes pay handsome dividends. While the cost of automatically detecting violations is minuscule compared with manual detection by police officers, the goal is not to increase the number of traffic tickets issued, but to dramatically reduce the number. It is probability of detection, not severity of punishment, that affects behavior. As automatic detection can make the probability of detection approach certainty, the number of violations can approach zero. The goal of traffic law is not to apprehend and punish violators, but to reduce harm by preventing violations.

Unlike airport security, which the public already accepts, the proposals above would save tens of thousands of US lives annually and not inconvenience, delay, embarrass, or disadvantage any law-abiding citizen.

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