

THE MULTI-PIECE TRUCK WHEEL

Ben Kelley

Senior Vice President

Insurance Institute for Highway Safety

A lecture given at the Johns Hopkins University School
of Hygiene and Public Health as part of its
Continuing Education Course in Preventive Medicine

Baltimore, Maryland

December 11, 1980

The Insurance Institute for Highway Safety is a research organization that looks at the causes of highway death and injury -- in other words, we're concerned with the nation's largest and worst trauma problems.¹ Now we had never heard of or investigated multi-piece truck wheels before 1976, and at that time we received a letter about the problem from Mrs. Mary Ehmann, a woman in Pennsylvania, who described the death of her son, an 18 year old trained auto mechanic in Phoenixville, Pennsylvania, who worked in a garage. The young man was a graduate of the Pennsylvania vocational school course for automotive mechanics. On July 2nd, 1976, a large dump truck came in to the garage where he worked with a tire to be repaired. The wheel on which the tire was mounted was a split rim type, or, more commonly known as the multi-piece wheel type, made of very heavy steel, with a locking ring which is inserted over the tire before inflation in a protective cage. Mrs. Ehmann's letter described the process through which her son did this. The letter explained that he put the tire into a protective cage and reinflated it. He rolled it out of the cage, set it down on the floor next to the truck and left it lying there under 100 lb/in² pressure. Eric was leaning over the tire to lay it down and adjust it when the rim blew. And now I quote from her letter, "His chest and mainly head were hit. The rim removed the frontal section of the skull, exposing the frontal portion of the brain, which consequently had bone fragments, dirt, etcetera imbedded in it. The one concussion of the top of the head was pressing the skull down on the main vein in the center, which the doctor said was punctured like a sieve." End of quote. The letter went on for 2 pages in which Mrs. Ehmann described the condition in which her son

remained alive for 2 days after his head had been smashed by the split rim -- before they took him off the life-support equipment and let him die.

Since her son's death, Mrs. Ehmann had made a number of observations which she related to us in the letter. First of all, what she had been told by authorities was a freak accident, turned out to be not so freak. This she discovered at the grave site, when another mother from a nearby town came up to her and said, "My son died this way in a garage a few months ago." Within a week Mrs. Ehmann had heard of more cases of deaths or injuries from explosions of multi-piece wheels in her area of Pennsylvania. Indeed, how mislabelled and misunderstood these deaths are is suggested by the death certificate for her son Eric, which attributed his death to a "tire explosion." Now tires are made of rubber; locking rings, which weigh between 10 and may weigh as much as 30 pounds, are made of heavy metal. (Slide one)

On your right is the type of wheel you would find on your car if you had a flat tire. It is a single-piece unit. If you've ever had to change a car tire or you've watched someone in a service station change a tire, you know that you put the tire down over the single-piece wheel and then force it around the wheel so that the bead of the tire pops down over the rim. The tire is then held on the rim by the two flanges, top and bottom. (Slide two) This, on the left, is a multi-piece wheel, the kind widely prevalent on trucks, buses, recreation vehicles and special highway vehicles throughout this country. In this example the wheel has 2 pieces. One is called the drop rim. The tire is dropped over it, then a locking ring is fastened down over the tire and the tire is inflated under it. The key point to remember is that

the locking ring, this heavy piece of metal, is being opposed by a tremendous amount of air pressure, up to 120 pounds per square inch depending on the size of the tire.² That is the origin of this hazard. (Slide three) Here's the locking ring up close. You can see there is a very small lip holding these 2 pieces of metal together, one of them under great air pressure. That is how it looks when it's assembled; now imagine it with an inflated tire around it.

Mrs. Ehmann also spotted something intriguing in her letter and our subsequent conversations. She spotted a pattern. She observed that this kind of explosion was not some random, uncontrolled, inexplicable occurrence happening once in a while, here and there, not worth investigating, but instead was happening often, was going unreported, and was producing consequences in terms of human damage that were catastrophic.

Finally, in her letter, Mrs. Ehmann spent a great deal of time talking about countermeasures, such as better education, better licensing procedures for mechanics, and greater enforcement of handling procedures for men and women working with these units.

As I said, our Institute didn't at that time know a thing about multi-piece wheels. We studied her letter and decided that our first task was to look at what happens when a multi-piece wheel separates. We undertook a demonstration, to look at the effect of multi-piece wheel explosions. (Slide four) This demonstration project was carried out in order to see what happens in the work place, and this is a typical work place situation. Of course, we prepared the wheel in this demonstration so that it would explode under normal inflation pressure, so as to give an accurate simulation. What you see here

is quite typical of a downed truck tire situation. The truck is out on the side of the road. The serviceman has been called to fix it. He must work with the rim and the locking ring that were there when he came up to the scene: they may be corroded or rusty, they may look just fine. (Slide five) Should what is euphemistically called a 'separation event' take place, this is what he will experience. (Slide six, slide seven, slide eight) He will be struck by the equivalent of a land mine in some part of his body -- very likely the chest or the head, where Eric Ehmann was struck. (Slide nine)

The event is literally so rapid that the human eye cannot comprehend it. The mark on the ground is condensation from the change in temperature of the air inside the tire. (Slide ten) The explosion also left a groove about a quarter of an inch deep in the asphalt, from the downward recoil of the wheel. (Slide eleven) The ring, moving at more than 120 mph, has picked the man up by his head, carried him up, and now flies free.³ (Slide twelve) Our test dummies are held together with metal structure at their necks so their heads will not come off under violent conditions. In the work place, where workmen are not so fortunate, their heads have come off in such explosions.

So, now we knew what this event looked like, and we were prepared to show it to other people. Next we asked, what are the human costs of this problem -- what is known throughout the nation about how often and severely it's happening? We began collecting anecdotal case information.

Starting in September 1976, we began a nationwide, unscientific review of news accounts saying anything about wheel or tire accidents. We also went to the files of the National Highway Traffic Safety Administration, the

federal agency in Washington responsible for highway safety. We contacted workmen's compensation boards and organizations and we talked to engineers and attorneys. After months of investigations we found that nowhere in the country was anyone systematically, reliably keeping data about "multi-piece wheel separation incidents." Even today, there literally is no category of data that will tell you how many of these are exploding, whether in the work place or on the highway. Workmen's compensation boards, by and large, have tended to throw such reports in with all sorts of other accident reports, and in general there is no reliable way to sort them out or distinguish them. We soon realized we were going to be up against a serious paucity of data -- that no matter what we came up with, it would be very much on the low side.

Incidentally, as of November 18 of 1980, we had come up with 710 cases of accidental multi-piece wheel separation on which we had information. These included 119 fatalities, 436 injuries -- all of them severe -- and 166 cases in which there probably was injury but we couldn't be sure from the reports available to us. We came up with another 160 cases about which not enough was known to determine the extent of injury or other damage in the case, and we came up with information indicating that there may well be many, many more such deaths and injuries across the country if the full data actually were available and known.

We realized, of course, that we were looking only at work place deaths. We had no idea of how often these multi-piece units were separating on the highway, thus allowing the tire to come off and causing the truck to be in a crash. We found out that most often the press and death certificates were

reporting these if at all, as freak accidents, or as tire explosions of unknown cause. It was literally a mess for anyone who wanted to look at the problem systematically.

We did, however, find one useful estimate from the industry itself, and this was from the Rubber Manufacturers Association, which represents companies who make both tires and wheels. The association estimated that of all such work place accidents, 13% will produce fatalities and 63% will produce injuries, most often serious injuries.⁴ But still we suspected that this was a big iceberg and we were looking at a very, very small tip. Our concern was, and our concern continues to be, that our 710 figure for accidental separations and our 119 fatality figure will be misperceived as an accurate estimate of all such events, rather than as the scratches on the surface of the problem that they in fact represent.

The problem with crashes caused by this kind of failure -- that is the separation of the ring followed by the tire leaving the vehicle -- is that very often the evidence may be destroyed in the crash itself. There may not be enough wheel or tire or truck left to reconstruct the events that led up to the crash. Certainly, the Bureau of Motor Carrier Safety in the U.S. Department of Transportation is correct in its finding, even on the basis of the incomplete data available today, that wheel and tire failures of one type or other are the second leading cause of truck crashes in the country.⁵ That is a very scary conclusion.

Consider for a moment the variety of ways in which multi-piece wheel failures can result in truck crashes. One way is when the ring is on the

inside of the wheel, rather than on the outside. Then the ring may explode and tear out the brake lines or steering assembly, or both, forcing the truck driver to lose control of the vehicle. In one case we know of, for instance, we found that while most designs of multi-piece rims simply can come apart when subjected to sudden deflation -- which is a danger in itself -- there is one type, known as the RH5 degree center locking ring, whose design appears to further increase the possibility of a wheel failure contributing to a vehicle crash. When mounted on the front axle, this design allows the ring literally to shoot inward.⁶ Several vehicles have had their steering mechanisms totally disabled in such failures, including a bus which went out of control in Blythe Township, Pennsylvania, on September 6, 1977, resulting in one death and 3 serious injuries. (That incidentally is one of the rare cases in which reconstruction was able to find the cause of the crash.)

There are many more variations. There have been incidents in which a separating ring will travel across the highway, or down the highway, and penetrate another vehicle. Or, the operation of a truck with a flat tire can cause a multi-piece rim assembly to fly apart, sending the components into nearby traffic or pedestrians. In illustration: On January 20th, 1968, a 46 year old Tampa, Florida, woman was killed when struck by a disengaged locking ring from a multi-piece rim. The driver of the truck on which the rim was mounted was unaware that he was operating with a flat tire on the left inside dual wheel, which is quite common because there is no feedback to indicate to the driver when one of his dual wheels is flat. In this particular case the locking ring disengaged from the rim, bounced down the road and struck the

woman's car. The ring crashed through the windshield, striking the woman in the head and killing her instantly. Only the quick response of the front seat passenger, who gained control of the car, prevented further injury or death. Incidentally the front seat passenger was the driver's daughter, who is still under psychiatric care because of the after-effects of that very horrible incident involving her mother's violent death in her presence.

Having now learned something about the possible variations of multi-piece wheel failures, we next sought to determine the prevalence of this hazard in the environment. We learned that the Rubber Manufacturers Association estimated in 1976 that some 85% of all trucks, truck trailers, buses, off-the-road vehicles, and privately owned recreational vehicles such as campers were equipped with multi-piece, rather than single piece, wheels.⁷ Now Firestone has estimated that just its product alone represents 45 million units that are now on the highway, of which more than 2 million are the so-called RH5 degree design, the one I described a moment ago as being particularly hazardous.

Those multi-piece units, of course, have very long lives in the environment. They stay around for years and years; even when a locking ring is disabled or discarded, another used one may be put on the same rim. Then we asked ourselves what is being done about this problem that killed Mrs. Ehmann's son, and is routinely killing and maiming a lot of other people? Basically, we found, two things were being done. First, the wheel manufacturing industry was denying that the problem existed in any appreciable magnitude. Second, when confronted with the data available, the industry --

along with just about everybody else, including Mrs. Ehmann at the outset -- would stress the need for better education of people in handling multi-piece wheels in the work-place, but would fail to mention the more promising potential for reducing these hazards by taking multi-piece designs out of the workplace and off the highway.

In 1977, Goodyear produced a half-hour film called "You May Not Get a Second Chance," which is still used in the field for training shop personnel handling multi-piece wheels.

The stress of that film is entirely on the role and duty of the individual handling the tire and the wheel to avoid being killed or injured by the results of an explosion. How pervasive this emphasis has been is pointed up by an article that appeared in 1971, in the journal, Plastic and Reconstructive Surgery, Vol. 47, No. 2. The article was entitled, "Truck Tire Rim Injury, a New Trauma Entity, " written by two doctors.⁸

The article describes a number of stunning cases of facial and related damage caused by wheel separations, and is accompanied by graphics of techniques for keeping tracheae open and so on, after such injury. The paper includes these warnings, and I quote:

"The changing of modern tires is dangerous unless it is done properly. Almost all the injuries occur in the process of changing, inflating or deflating the tire. The rim blows apart and it is propelled like a missile by the pressure, . . ."⁹ Here is another quote, "Extra care should be exercised to avoid crippling injury or even death. Due to the proximity between the tire and the mechanic, maxillofacial injuries are most common when

a tire blows out and propels the ring at an undetermined velocity. If the mechanic has a proper understanding of his work, and if he exercises suitable care and takes the recommended precautions, this specific type of injury can be prevented."¹⁰ End of quote.

This pattern of emphasizing the responsibility of those handling multi-piece wheels rather than those designing, manufacturing and selling them is clear. It is bolstered by manufacturer responses in court cases in which injured individuals or their survivors have sued manufacturers for separations, and by manufacturer responses to government agencies investigating patterns of such explosions. The handling emphasis was well summed up in a petition filed in 1976 with the Occupational Safety and Health Administration by the Rubber Manufacturers Association.¹¹ The petition was that OSHA adopt a set of handling standards in the workplace to take care of this hazard. There's nothing wrong with that so far as it goes. The problem is, of course, that it does not begin to go far enough. The idea that better handling will solve the matter is a myth. For instance, California is a state that has had OSHA type requirements in effect in the work place for many years for multi-piece wheel handling. Yet no data suggest that California's experience with wheel separations in the work place, and greater protection against injury as a result, is any better than in states without such rules. Further, Firestone itself did a study in 1977 which found that a host of written materials that Firestone had introduced into work places regarding its multi-piece wheels were by and large ineffective.¹² (Slide thirteen)

In the meantime, in the work place, service people may -- or may not -- have sufficient education as to handling of rings and rims that are corroded

or rusted or twisted. They may be under the pressures of time when the boss is saying, "Get that truck out of here, there are 4 more waiting to be fixed."
(Slide fourteen)

Here's one way to get a feeling for the amount of material that is dumped on the serviceman who's required to work with wheels like this at a truck maintenance facility. He's faced with charts that identify more than 129 possible combinations of truck rims and rings, some of which will stand a chance of killing him if he happens to put them together wrong. And these instructions are being posted, in some cases, to be read by functional illiterates, who are not equipped to handle the levels of information that are involved here. (Slide fifteen) Indeed, one very literate executive of a wheel manufacturer, giving a demonstration in defense of multi-piece designs a few years ago, boasted that anybody could learn to put one of the wheels together properly in 15 minutes. He had never done it, he said, but he would be taught right there by an experienced service trainer. An hour's worth of instruction later, the executive still could not properly assemble the wheel.

The available training material itself is confusing. The safety cage into which the wheel should be placed for handling is an example; it looks like from some instructional material that everything will be fine. Well, if you use it but stand too close to the cage and there is an explosion, you may get killed. There are two cases of cages exploding with wheels in them and killing men nearby. One was here in Maryland. A multi-piece ring exploded in a steel safety cage. The explosion expanded the steel bars 10 inches, propelling the man 5 feet into a nearby piece of equipment. Mrs. Ehmman's son, the young man in Pennsylvania whose death brought all this to our

attention in the first place, was using a safety cage. To the best of our knowledge he had followed all the procedures prescribed for handling these wheels, including inflating the tire in a cage. Then, he had rolled the inflated tire out of the safety cage and set it down next to the truck. At that point, the ring blew off. I asked Mrs. Ehmann recently what she thought now about the early emphasis on handling, and she said, "You know, I assumed then that Eric had done something wrong, otherwise the thing wouldn't have exploded and he would not have been killed. But I realize now that I have no reason to think that he'd done other than exactly what he was supposed to do, and yet still got killed."

We have here a classic situation of active versus passive approaches to controlling the relationship of hazards and people who may be damaged by them. The active approaches are traditional and well-known in this field: they rely on the notion that one reduces the risk of injury from environmental hazards by modifying not the hazards, but the detailed behavior of people thrown into contact with them -- a notoriously ineffective approach as public health history has proved time and time again. As it turned out, for nearly 30 years, in the marketplace, there has been an entirely effective passive approach to this exploding wheel problem -- one involving a change not in the behavior of people in contact with this hazard, but in the hazardous agent itself, in this case, the multi-piece wheel. This long available passive alternative is the single-piece truck wheel.

A bit of history is in order here: truck wheels originally were developed as multi-piece units because they were used in conjunction with tube-type tires; and it was far easier then, and in some cases necessary both

for servicing and operation, that the tires be tube-type. However, in the late 1940's, with the advent of tubeless tires, it became possible and indeed desirable to use single-piece wheels on trucks¹³ -- wheels with no separate locking rings capable of flying apart in a malfunction.¹⁴ For truck fleets, the single-piece designs required much less maintenance. They can lower the rate of flat tires by a magnitude of 15 from that experienced with multi-piece units. They wear out much less frequently and much less severely. As a result, they've been endorsed by trucking companies all over the country. We asked a number of big truckers, such as McLean Trucking Company in Winston-Salem, North Carolina, one of the large fleets, which they used, multi-piece or single-piece wheels. It turns out the big fleets use single-piece wheels, largely for cost-related as well as safety reasons. Among the advantages of single-piece rims is the labor reduction for tire change, fewer parts to stock and clean, and the absence of inner tube purchases. Greyhound is a good example of a pleased single-piece wheel user; and I quote a letter from them, "For many reasons, including the hazards involved, we completely eliminated multi-piece wheels from our operation in the late 1960's."¹⁵

Fifteen years ago Fleet Owner, the magazine which is the trucking industry's bible on workplace operational matters, published an article that included the following statements about truck wheels and rims, and I quote, "The benefits of single-piece wheels in reducing hazards to truck mechanics are clear." End of quote. The article then described two tragic cases. In one, a locking ring let go when a tire man was airing a truck tire. The flying ring cut off his arm, then went on to embed itself in a concrete

ceiling, where it remained for many years as a constant reminder of what can happen with these kinds of equipment. The other case cited in the article was even more tragic. A tire man was kneeling down inflating a soft tire while it was still on the truck. The locking ring had become loose. It let go with so much force that it decapitated the man. The article in Fleet Owner concluded, and I quote, "While a multi-piece tire can fire its ring with the same destructive force as a bullet, single-piece wheels give you only one piece to worry about: no rings, no side rings, no flanges. The hazards of mismatched parts are eliminated forever." ¹⁶ End of quote.

Had this alternative been looked at effectively in the real world? We found that the answer was it had not. There appeared to have been interest at one time by the National Highway Traffic Safety Administration, which proposed a motor vehicle standard in 1971 which would have extended to trucks the same performance requirements now applied to automobile wheels. These requirements are that in a rapid deflation at 60 miles an hour, your automobile wheel must be able to hold the tire on, and to run flat for a predetermined period without losing the tire. The agency proposed to extend that to trucks, but then it withdrew the proposal at the request of the trucking industry.

The regulation was dropped because the agency said, "The sudden deflation test was determined to be not practicable for testing rims on wheels in 2 or 3 piece construction, that is multi-piece construction, because the pressure loss would cause the components of the wheel to come apart."¹⁷ End of quote. In other words, the federal agency was saying we're not going to require that the tire be retained, because to do so would mean that the wheel would not be able to fly apart and sent a piece of metal across the highway

and cause a crash, or kill someone in the workplace. That decision, incidentally, was allowed to sit uncontested for years. It was not, as I say, until Mrs. Ehmann got in touch with us, that we realized that there was a problem, or realized the immensity and severity of the problem.

Another attempt to correct the problem that failed also was by the federal agency. It opened 2 investigations in the early 1970's into possible defects of specific designs of multi-piece wheels. One of them is known as the RH5 degree design¹⁸ and I've talked about it already. Another is the K series design.¹⁹ The investigations began with a bang and ended with a whimper; the agency failed to pursue the probe, even though a 1971 internal agency memo stated that, quote, "It is the failure of these wheels while the trucks are moving which should give the general public the most cause for alarm." End of quote.

Those failures, the ones causing highway crashes, are the area about which we have the least information, and need the most information.²⁰

One other thing we've found, bit by bit over the years and with ever increasing interest, is that the judicial branch of government also has been getting involved. That is encouraging, because court case law sometimes can produce patterns that bring about important societal changes. What was happening in multi-piece wheel litigation, generally, was this: an attorney would bring suit against a wheel manufacturer, the plaintiffs would allege the inherent hazard of the product and go to court on behalf of the individual injured by an exploding wheel, or the individual's survivors in the case of a fatality. Everybody would get a look at the evidence against the wheel's design; then the wheel manufacturer would settle with the plaintiffs on

condition that evidence be put under a non-disclosure agreement, with the result that a permanent obstacle was erected to the evidence being available to other lawyers, public health researchers or anyone else. The parties would not discuss the case again. Eventually, however, a group of lawyers handling such cases moved to bring them together in what is called a consolidated case, so that all the issues could be looked at at the same time in one court and the evidence of multi-piece wheel failures that is of common interest to all of these cases and attorneys could be shared.²¹ This was fought very hard by the manufacturers, but the courts have agreed and the consolidated cases now are being heard.

An interesting sidelight to this came up in an article of January 28, 1980, in Automotive News, a trade publication for motor vehicle dealers. The article pointed out that 41 cases are now consolidated, and that under a gag order from a Federal Court in Kansas City, the attorneys in those cases whether for the plaintiffs or the wheel manufacturers may not, during the pendency of the consolidated proceeding, discuss what is going on in them. Apparently, however attorneys for the plaintiffs are pursuing the theory, and I quote the Automotive News article, that, quote, "During Watergate, a political slush fund was used by the wheel and rim makers through the Nixon White House to influence the National Highway Traffic Safety Administration." End of quote. You'll recall that that is the agency that was investigating these wheels. In short, the article seems to be saying that two multi-piece wheel defect investigations by that agency were squelched or may have been squelched because of political payoffs. The article went on to say, quote: "So far, plaintiffs have taken depositions from Jeb Stuart

Magruder, of the Committee to Re-Elect the President, John Dean, former White House Counsel, Maurice Stans, former Secretary of Commerce, Herbert Kalmbach, a lawyer who collected money for the Nixon Committee, and Leonard Firestone, who retired from the Firestone Company in 1974 but has been nominated to return to the board of directors."²² End of quote from Automotive News.

What is happening currently in the multi-piece wheel issue? First of all, OSHA has issued its very lengthy handling standards.²³ Under OSHA procedures they are much more likely to be enforced in larger work places than in "mom and pop" service stations, which also handle multi-piece units and do so often. The OSHA rules will put a lot of charts on a lot of walls; how well those charts will be read and understood is hard to say. The rules will put a lot of safety cages into work areas; how regularly those cages will be used, and, if used, how well they'll do the job when separations occur, also is hard to say. The outlook frankly is not encouraging. Our Institute did a preliminary review of what the effect of the OSHA rules would have been, had those rules been in effect in some 330 wheel explosion cases reported to us in the past. We found indications that of those 330 cases, which involved death or injury, only 127 would have been under OSHA's jurisdiction. The rest apparently occurred outside of OSHA's workplace jurisdiction. One hundred and forty-five cases may have fallen totally outside the OSHA regulations no matter what the circumstance. Thirty-one cases occurred when a tire and rim assembly was being moved from the inflation point to the truck, which is a procedure not covered by the rules. Ten occurred even though the practices set forth in the rules were followed, and 58 lacked sufficient information as to whether they would or would not have fallen under OSHA's jurisdiction.

Incidentally, these numbers are biased in favor of OSHA, because the substantial number of reports involved were received from workman compensation boards; cases not reported doubtless would be even more heavily leavened with instances where the OSHA rules wouldn't have applied.

When a hazard in the public arena, in the environment, is being looked at, a key question must be, who bears the cost of that hazard? If the manufacturer of the hazardous product is not directly, adversely affected from a cost standpoint, there is very little incentive for that manufacturer to eliminate the hazard; in fact, in the multi-piece wheel situation, there is great resistance to change by these manufacturers. The cost is being borne by the damaged people, principally, and to a much lesser extent by workmen's compensation systems of the states, by society's support of medical facilities, and by private insurers; there has been so far no real cost penalty to the manufacturer of the product for the results of those failures. The consolidated court cases, of course, may help to change that.

In June 1978, our Institute pulled together all that we could on this problem. We had done our demonstration project, we had filmed it, we had counted our cases, and we had reviewed the court files as best we could. At that point we filed the first of 2 petitions with the National Highway Traffic Safety Administration. Our first petition urged that all multi-piece wheel assemblies on the highway be declared defective and recalled.²⁵ We filed this to get the pump primed, to refocus attention on the defective nature of this product. Our petition produced very few ripples in the pond. There were a couple of short press stories about it that somehow got it confused with a school bus wheel problem. But nothing much seemed to happen until a few weeks

later, when we got a call from the staff of Congressman John Moss. Mr. Moss was the chairman of the Commerce Committee oversight subcommittee in the U.S. House of Representatives. He was one of the most vigorous consumer and public health advocates ever to have served in Congress. Congress was about to adjourn and it was the end of Congressman Moss's last term. He was stepping down; he had not run for re-election, after having served many terms, and it was a loss to the public that such a strong advocate for public health was leaving the national legislature. We had a call from Mr. Moss's staff asking, "What is this business about multi-piece truck wheels? We told them about it, in meetings over several weeks. Shortly thereafter, Congressman Moss announced that as his last act in Congress, he would chair a two day hearing in October to publicize this hazard, and to find out why the government was doing nothing about it.

Meanwhile, we were preparing a second petition, to request that the National Highway Traffic Safety Administration set a performance standard -- very much like the one they had abandoned in 1971 -- requiring that wheels hold tires in place under deflation situations, rather than allowing the tires to be blown off and with them, the metal locking rings. On about October 1 we received a call from Congressman Moss's staff, saying that the hearing had been cancelled. Lest conspiratorial or ulterior motives be suspected for this, the explanation was very simple, and very sad. Mr. and Mrs. Moss had been in a car crash a few months before, they had been injured, and they were not feeling well. As desperately as they tried, the staff members were unable to find another member of the subcommittee available to sit on such short notice, to chair the hearing, and Congress was adjourning. We therefore had

to find another way to generate enough interest to get this issue before the public. We decided that we had to go forward on our own, without the congressional hearing, and so we called a press conference for the morning of October 2, 1978. Our senior staff met with reporters in a large room, with tables full of rings and wheels, photographs and displays of the injurious consequences of wheel explosions, and of course our test film. Mrs. Ehmann, who was present, is a very shy lady and did not want to say anything at all, but she was there, so we introduced her. At one point late in the press conference, however, a reporter asked, "Well, what's this going to be in terms of cost? Aren't you asking for another huge, costly regulation? What's it going to cost these poor fellows who manufacture these wheels, these poor companies to replace all of these? These dollar burdens of regulation are just too much." Mrs. Ehmann suddenly stood up, without notice, completely unplanned, and came to the microphone. She said she'd like to answer the question, and did so by very quietly and fully describing what it's like to go the hospital when they call, to tell you that your son has had his head blown off by one of these wheel components. That was the end of the cost benefit issue in that press conference.

We filed our second petition on October 2nd of 1978,²⁵ and both of the petitions then were acted on by the National Highway Traffic Safety Administration.

The first petition, requesting the defect investigations, resulted in NHTSA reopening the RH5 degree and K series wheel defect cases, and sending a letter to manufacturers asking that they voluntarily take the wheels off the highway and replace them with single-piece wheels. That was in 1979. The

manufacturers replied in vehement terms that they would do no such thing. As to our second petition requesting a standard for the future that would in effect ban these designs from being produced and put on the highway, the agency docketed it for consideration,²⁶ and let some research contracts to gather more data and do more testing. Subsequently, with the change in government, the Department of Transportation indicated it did not think either a defect recall action or a standard for future wheel performance was warranted.²⁷ The government, in dropping this action, alleged that all of these hazardous designs have been removed from the highway. We have been unable to find any evidence that that is the case.

Why are these sold and they still are being sold? Why do people buy these designs? If one were to look at a hazardous wheels sales graph for multi-piece and single-piece wheels, the multi-piece unit sales would be seen as gradually going down -- yet multi-piece still apparently account for about 55% of the sales. The professional, knowledgeable, cost sensitive truck fleets have gone, by and large, to single-piece. Multi-piece is still being used by, among others, the fellow who doesn't want to buy a whole new assembly if he can just buy the ring that you put on the wheel you already own.

Where does all that leave us? It leaves us and it will leave you, when you walk out on the road or drive down the highway next to commercial truck traffic, in proximity to a very nasty environmental hazard which you probably didn't know much about before you heard this lecture.

In a recent report on the "Sixty Minutes" television show on CBS, correspondent Mike Wallace put it very aptly when he described the problem as one of, quote, "killer wheels."

There are useful lessons to be learned here. One is that product hazards are not usually or basically the result of evil intent of some manufacturer, but tend to be initially due to a lack of knowledge of the consequences of putting a certain product into the environment. This product, the multi-piece wheel, is one for which there was originally no alternative. There was only the multi-piece configuration, back in the early days of trucking. Later, hostility, inertia, inability to change and legal problems became involved in the effort to force a change. The manufacturers were not themselves adversely affected in a cost sense, as I've said. If the courts, in a consolidated case, do ultimately shift the cost to the manufacturers, that might help bring about a substantial change in the manufacturing and sales practices for these wheels.

Finally, this issue points up the inexorable slowness of the government process, including the court process, to come to terms with widespread, deepseated, environmental hazards that have gone on for decades. These are slow processes indeed, and if they do nothing more, they instruct us as we grow older as to the need for developing a philosophy of life, -- at least life in the public health vineyards -- that does not depend on instant accomplishment.

Perhaps the most cheering side to this case history of a hazardous product is that it shows that one person -- in this case Mary Ehmann, a housewife in Lancaster, Pennsylvania -- just one person can make a difference.

NOTES

1. Hartunian, N.S.; Smart, Charles N. and Thompson, M.S. "The Incidence and Economic Costs of Cancer, Motor Vehicle Injuries, Coronary Heart Disease, and Stroke: A Comparative Analysis." American Journal of Public Health, Vol. 70, No. 12 (December 1980), pp. 1249-1260.
2. Arminio, John D. "The Inherent Design Hazard of the Multipiece Rim." Hazard Prevention, Vol. 14, No. 5 (May/June 1979), pp. 4-9.
3. Petition for the Initiation of Rulemaking to Amend Federal Motor Vehicle Safety Standard No. 120, October 2, 1978, Insurance Institute for Highway Safety, Washington, D.C., Attachment A.
4. Occupational Safety and Health Administration. Servicing Multi-Piece Rim Wheels, 29 CFR Part 1910, 45 Fed. Reg. 6706, 6707, January 29, 1980, effective April 28, 1980.
5. Federal Highway Administration, Bureau of Motor Carrier Safety. Commercial Vehicle Front-Tire Failures. Washington, D.C., 1974.
6. See Note 2.

7. Lovell, Malcolm R., Jr. "Petition for Promulgation of a Standard Relating to Multipiece Wheels and Rims." Rubber Manufacturers Association letter addressed to Morton Corn, Assistant Secretary of Labor for Occupational Safety and Health, April 21, 1976.
8. Bautista, Basilio N.; Kernahan, Desmond A. and Vistnes, Lars M. "Truck Tire-Rim Injury -- A New Trauma Entity." Plastic and Reconstructive Surgery, Vol. 47, No. 2 (February 1971), pp. 117-121.
9. Id., 118
10. Id., 120
11. See Note 7.
12. Pacilio, John, Jr. "The Effect of Three Methods of Instruction on Task Performance," Proceedings: Academy of Management, 37th Annual Meeting, Orlando, Florida (August 14-17, 1977).
13. Bradley, J.N. "The Development of the Modern Truck Disc Wheel," Society of Automotive Engineers, Paper No. 700057, New York: Society of Automotive Engineers, January, 1970.

14. Putnam, Gil "Don't Overlook Your Rims." Fleet Owner, September 1966, p. 100-105.
15. "IIHS Reports More Multipiece Wheel Mishaps to NHTSA," Status Report, Vol. 14, No. 6, April 9, 1979, p.7.
16. See Note 14.
17. 39 Fed. Reg. 19505 (1974).
18. National Highway Traffic Safety Administration, Office of Defects Investigation. Defect Investigation No. 150, RH5 Two-Piece Rims, Firestone, Kelsey-Hayes and Budd, 1947-1972 (initiated October 6, 1969).
19. National Highway Traffic Safety Administration, Office of Defects Investigation. Defect Investigation No. 215, Goodyear Two-Piece Wheels, Models KB, KW, KWX, 1950-1972 (initiated April 16, 1970).
20. NHTSA internal memorandum from Frank Levy to Frank Berndt on the subject of the RH5 Two-Piece Wheel, November 9, 1971.
21. In Re Multi-Piece Rim Products Liability Litigation, 464 F. Supp. 969 (1979).

22. "Watergate Crew Named in Wheel Suit," Automotive News, January 28, 1980, p. 36.
23. See Note 4.
24. Petition for the Initiation of a Defect Investigation of Multi-Piece Wheels, June 14, 1978, Insurance Institute for Highway Safety, Washington, D.C.
25. Petition for the Initiation of Rulemaking to Amend Federal Motor Vehicle Safety Standard No. 120, October 2, 1978, Insurance Institute for Highway Safety, Washington, D.C.
26. National Highway Traffic Safety Administration, Docket 71-19, Notice 7; 44 Fed. Reg. 12072, March 5, 1979.
27. 46 Fed. Reg. 21204, April 9, 1981, paragraph 9.