

LOS ANGELES, CALIFORNIA; THMSDAY, JULY 29, 1999

1:00 P.M.

ARNOLD SIEGEL,

having been first duly sworn, was examined and testified as follows:

MR. RENNIE: Mark, do we need to put anything other than the usual stipulations, whatever they are in your jurisdiction, on the record?

MR. LEDBETTER: No. I'm going to try to get the idea though that just because you and I get along doesn't mean that the next case I have with the next person I have is going to be this way. I told Arnie, I said you and Kelly were two of the nicest lawyers I've ever met. I can't figure it out. I keep waiting for that not to be true.

EXAMINATION

BY MR. RENNIE.

Q BY MR. RENNIE: would you tell us your name, please.

A Arnold W. Siegel.

Q Business address?

A 4461 Hayvenhurst Avenue.

Q And the nature --

A Encino 91436. That's in California.

Q And the nature of your business?

A I'm a research scientist and I do work in the field, in the automotive and aircraft accident and injury analysis area.

Q When were you retained in this case?

A "Hired" is the word I usually use. I was first contacted by letter. And I was away out of the country, finally had a phone contact on May 7th, '98.

Q Were you hired as of that date?

A Yes. There was an advance check that was sent to me at that time.

Q You said '98?

A '98.

Q What was it that you were hired to do at that time?

A To look into the accident sequence, but particularly to review the mechanism of injury, the injury, with the analysis to include if a belt had been used, what the difference in the injury pattern would have been.

Q Have you completed that work?

A There are things to be done, but my opinions are pretty solid as of this time.

Q Does "solid" equate with final opinions basically?

A Reasonably scientifically certain.

Q What else is there to be done that could affect your opinions, bolster or otherwise I guess?

A Some details might be filled in. first off, I'd like to review depositions. I have not reviewed depositions, particularly Mr. Entwhistle's and anybody else. I know Fuller but just acquainted with him. I'd certainly like to read the detailed descriptions that the bus occupants will produce in their depositions or have produced.

I have not been to the scene. I've seen photographs of the bus and the scene, but there's often information that comes out in review of the three-dimensional scene of the vehicle. I have not seen all of the medical records for every child.

Q Have you reviewed some medical records for some passengers?

A Yes.

Q And can you give me their names?

A Sure. Christine Chadwick, I've looked at some of her medical records. I haven't seen the nurse's notes and some of the progress notes, lab reports. Same with Carlock, Thomas Carlock, C-a-r-l-o-c-k-e. Am I right, there's an "e" on Carlock? Carlock's name ends with an "e"?

MR. LEDBETTER: No.

THE WITNESS: L-o-c-k?

MR. LEDBETTER: Correct.

T HE WITNESS: And Joey Paulman, P-a-u-l-m-a-n. And then the brother, Charles Chadwick, I have not reviewed his medical records at all.

Q BY MR. RENNIE: Have you reviewed medical records of any bus occupants who aren't parties in this lawsuit?

A No, and I would like to do that just to get a feeling. I understand there were -- about two-thirds of the 30 children were injured to some degree or another, some serious injuries, of course the near fatal injury to Ms. Chadwick, certainly critical injury. But I would like to review those others. It just helps to round out the total feeling of the energy dissipated.

Q Have you done a reconstruction of the accident?

A Fairly tightly, yes.

Q Why don't you describe that for me.

A The rollover speed was in the order of about 25 miles an hour when it from the touchdown of what the officer is saying the right front tire to the final position of rest. Now, that does not include damage, but that's just that last 39 feet that it decelerated. But let me go on. When it left that driveway embankment, it traveled 32 plus 39 feet. And its speed at the embankment, coming off the embankment, would be in the low, mid 30s: 30, 35. And then when I look at the speed, no braking, braking and light braking, the bus could have been anywhere from the 40 miles an hour range when it left the roadway -- ROR, ran off roadway -- to as high as the high 50s. My opinion is that it's probably somewhere in the 40s, mid 40s.

Q Are your speeds based on kind of an energy analysis over the distance?

A Yes. Energy deceleration rate analysis. The bus had a three-tenths of a mile distance to go from the stop sign to the area where it ran off the roadway. And it could have even gotten up into the 60s. But normal acceleration would have been in the mid 40s.

Q The last 39 feet of decel, is that the roll sequence?

A Yes. It's hard to divorce it from the elevation and the tripping mechanism because what one uses -- of course, that's the work I started -- what one uses is an average deceleration, which usually includes that airborne aspect. So I'd feel pretty comfortable with 30, 35. In fact, I'd feel more than just comfortable. Reasonable scientific certainty on that.

Q That's the --

A The total roll from the tripping mechanism to the end. But it hit down fairly hard. Fortunately, soft surface.

Q What did you use for a rate of decel over that distance?

A Half a G, which is right in the middle of the ballpark. And my work back some years ago pretty well established what those roll rate decelerations are.

Q Any difference in the fact that this is a school bus versus a passenger car or other large vehicle?

A The center of gravity is a little bit higher, which means that its propensity to roll is a little greater so that, if anything, my numbers are what I would say maximum numbers. There is a lot of disturbed dirt as the bus is coming to the driveway. That indicates fairly rapid deceleration before it hits the driveway embankment.

But the roll rate is still pretty standard. 35ish, 30 is a very conservative figure.

Q When you look at the impact deceleration to a bus or in an accident like this, do you have to look at the deceleration to the vehicle or to individual passengers, or how do you analyze that?

A I did not do a structural analysis on this bus this particular time. From past experience that crush decel rate would vary from the rear of the bus forward. It really requires a fairly sophisticated analysis, and I don't think it's necessary.

But a good working figure would be in the rear of the bus at the overall bus rate would probably be somewhere no less than 5 to 10 G and maybe in the 10 to 15 G range. But as you point out, it is unique to how the individual strikes the interior surfaces.

As the distance of that load increases, the deceleration rate, of course, decreases.

Q Was the highest rate of decel for this accident the rear area of the bus?

A It appears so.

Q And when we say rear, are we discriminating right side/left side, rear front to back? Can we be more specific on what area of the bus saw the highest deceleration?

A I think it's fairly obvious from the photographs that it was probably the rear one-third near the roof rails where the roof and side comes together where the maximum bending took place. I don't know precisely, and the photographs aren't indicative of the surface it decelerated on. That's why I'm being a little bit broader. However, injuries can occur even with a 2 G to a 3 G impact. They just are exacerbated by the higher deceleration rate.

Q What can you really do in terms of being scientific to look at the damage here and come up with the crush deceleration?

A There are a lot of approaches which I'm not capable of in terms of a mathematical shell type analysis that I would hire somebody who is really in tune with that work, which can give you some fairly tight numbers. There are a lot of structural components built in that area, and that would have to be a structures engineer.

But I don't think, in my opinion it does not lead us to productive pathways. Academically of interest, of course.

Q Because why?

A The latter part or the former part?

Q Why don't you think that it's important to look at the crush in that level of specificity here?

A Because the nature of the analysis really relates to the use or nonuse of restraint systems and the reduction or elimination of the injury severity patterns. And while there was a minor -- there was a frontal impact and then a tripping and rollover, it's the loose base in the steel container versus the padded base in the steel container that's really of importance.

The catastrophic injury was not a function of the deceleration rate, except secondarily.

Q If you're analyzing the effect of this accident, belted versus nonbelted, does the acceleration of the person, had they been belted, become important to you? That's a pretty bad question, but do you know what I mean?

A I think I do. It's really the posture that, the load or the application of the load. In this particular case, a belted person would not have sustained the type of subluxation. If we consider Ms. Chadwick as being the catastrophically injured party, she would not have sustained it in an injurious-producing position.

It was -- these types of injuries to be produced by a belted person require extraordinary forces. They were not present in this case.

Q Have you reached opinions or conclusions about whether or not a belt would have prevented the injuries of, let's start with, let's go one at a time: Christina Chadwick?

A The first approach is that restraint systems on a generalized basis -- in this case we'll look at it specifically too -- but on a generalized basis, a belt does not prevent an injury. What a belt does is reduce the severity. There's several purposes for belts. In this case the reduction would be because of the containment within the seat or the restraintment, if you will, within the seat. The forces are not sufficient to produce this kind of injury.

In this particular case it is my opinion that the injury would have been prevented because of the dynamics and kinematics of this particular accident vehicle. Generally, I say elimination is not something I work with. In this case, yes, elimination of the injury to the T11, L2, L3 area.

Q What was the mechanism of injury to that area of her body?

A The best that I can tell without a discussion with the physician is that it was an alternative of either the forces being applied through the upper back or through the buttocks -- my suspicion is it's probably through the buttocks -- when the body is in a bent position and

thrown and landing such as somebody jumping off a ladder and landing on their buttocks with their body bent.

However, I haven't seen the X-rays and I haven't talked to the physician. But that would be the crushing, burst fracture, subluxation would be, as I read the reports, my understanding of the mechanism and how the forces were applied.

Q I don't know if we need to take these one at a time or not. But for Carlock, Paulman and the other Chadwick boy, have you formed opinions as to whether or not their injuries would have been different had they been belted in the accident?

A By the way, Ms. Chadwick did have what I understand to be a splenectomy. And I do believe that that injury would not have occurred with the belt on, but I need to know more about it.

Taking them in the order that I have, Thomas Carlock, he has an acetabulum fracture on the anterior portion of the acetabulum. There are several mechanisms, but it's most likely that that was a mechanism where his knee was driven back, the femur opened up the socket versus a lateral blow. Or perhaps it can happen when the legs are splayed outwards. But I would defer to the physician, Dr. Canale, as to that mechanism. It appears likely that it's through the knee, a classical nonuse-of-a-lap-belt type injury.

Insofar as any bruising, contusion, so forth, that I wouldn't be able to discuss because you can still receive those types of bruises, contusions, muscular injuries with the use of restraint systems.

Joey Paulman was ejected. The rear-door, emergency exit did open. His ejection through that back area, back door area, makes me think that the striking of his chin caused that bilateral mandibular fracture, was obviously against an object. There's a remote possibility it was the front seat. The seat in front of him, pardon me. There's a much, in my opinion there's a much higher probability of occurrence during that ejection mode. I need to know if there is dirt in the wound. And until I get into those minutiae of medical records, I can't tell you.

His right arm fracture, that's just a classical flailing type, especially if he's going through that ejection mode. He's about in the middle of the bus. So he moves quite a ways. He may have struck other children as they were being thrown about too.

It's surprising that more children weren't ejected. And they may well have been. I just don't know enough about the other kids yet.

As far as Charles Chadwick, it's my understanding that he somersaulted within the bus. And his cuts, bruises and contusions are basically classical injuries in that kind of rotational motion.

Now, the others, the fractured leg and some of the other kids, I can't tell you because I know less about them. All of those kinds of injuries are incredibly reduced in severity through the use of restraint.

Q If you categorize the injuries of all three of those on an AIS scale, what would they be?

A Well, Ms. Chadwick, of course, would be --

Q I'm sorry. Skipping her.

A Okay. The other children would be one to three as I understand it now. The AIS scale, which you probably know I was responsible for, is very good in classifying injuries but it doesn't take into consideration some of the post-accident involvement. So from an AIS standpoint, I'd say one to three with a residual aspect.

I understand Thomas Carlock had a very good recovery. The hip fracture was very good for him, fortunately, that it wasn't more of a blowout. I don't know about the bilateral mandible. That can cause problems later on because of the temporomandibular joints, TM joint. That's a physician's call or maybe a physiatrist's call.

Q Can you tell me to a reasonable degree of scientific certainty that, comparing their injuries on an AIS scale, that they would have had a different level of injuries had they been belted versus nonbelted?

A Chadwick, absolutely, probably down to one or zero depending on a number of factors. My thought would be that it's probably in the one level because of her location. Carlock, again, one would be the expected injury pattern with the belt on, restraint system.

Joey Paulman, I don't have his -- his seated height I understand is about 24 inches. I don't know the specific seat back energy-absorbing characteristics. But the best that I can do at this point in time with a lap belt alone, and I don't necessarily say that lap belts are the appropriate restraint system, but with a lap belt only, I do not believe -- there's a very low likelihood. In other words, a possibility, yes, but not a probability of a jaw fracture of the type that he received.

Charles Chadwick, because of his muscular bruise contusion, I would say the same or less with a belt on. We do know that the two belted occupants received very little injury, if any. So we have a real opportunity to contrast.

Q When you said two belted occupants, you're speaking of the driver?

A The driver and then the young man who had the handicap, Levette. I'd have to look his name up again.

Q What's your understanding of the driver's injuries?

A As I understand it now today, they were just minor in a muscular soreness type. I do-not recall, and it may be just memory, I do not recall significant lacerations or anything of that type. But, again, I haven't seen those medical records.

Q If the driver sustained rib fractures, where would he be on an AIS scale?

A Depending on the physician who was doing the recording, it could have been a two or a three, depending on the nature of the rib fracture.

Q Is it your understanding that the driver's belt failed during the accident?

A I don't know the answer to that. I just don't know.

Q What's your understanding of how the other, the one student who was belted, what's your understanding of how he was belted into place?

A Again, that's information that I don't have at this time.

Q Assuming that this bus had lap belts available for all of the occupants who were in the bus at the time of the crash and assuming that those lap belts had been worn, are there any occupants who may have sustained more severe injuries being belted rather than unbelted?

A The only ones that I can currently comment on are those that I have some understanding, having not reviewed all thirty medical records. Would they have been injured to a greater degree if they had had belts on? Is that the question you're asking me?

Q Yes.

A I see no evidence to indicate that at all, given the dynamics and kinematics of this accident.

Q What if we look at the areas where the major crush occurred in the rear of the bus and assume that there had been belted occupants?

A Lap belted only?

Q Lap belted only.

A I see no evidence to indicate that because their bodies would have been moving forward and then pretty much stationary in that position until the crush and then they would move towards that area. If you're asking me could there have been, certainly things are possible. But given the circumstances of all of those kids who were in those areas and not having severe injuries, it's almost like a Poisson distribution.

The tragic, unfortunate nonuse of the belt of Ms. Chadwick is, and her location, plus whoever bumped into her and whoever moved her into these locations is something that gets somewhat speculative. But basically no injury if belts on given, you know, everything else that we know about this accident sequence.

Q I'm not sure if I followed what you're saying about what would have occurred with belted occupants in the area of the greatest crush, the right rear section. How would those occupants have escaped serious injury being in the intrusion area?

A The principal reason that they would have had their injury pattern reduced to a very, very low level would have been that the forces would not have been applied to Ms. Chadwick either through the back/upper torso or through the buttocks.

Q I misled you a little bit. I'm not speaking of any of the plaintiffs in our accident. I'm looking at the area of the bus where there was the greatest amount of crush, and I want you to assume for the purpose of the question that there were belted occupants in that area.

How can you say that those belted occupants wouldn't have been severely injured or injured to an extent greater than unbelted occupants given the amount of intrusion?

A By case comparison, by looking at other large vehicle accidents with belted occupants, van-buses and other types of -- there's one case that I can't discuss because it is in litigation at this point in time, coming very close to litigation. But using van occupants with rollovers and crush, van occupants of either yellow van, school bus van or large vans up to the 12-, 14-passenger vans with belts in rollovers, by case comparison it's traumatic. Everything else being equal, this does not happen. That's a primary empirical evident piece of evidence.

The other aspect would be my understanding and all my years of experience in dealing with this very matter, given the amount of crush, the deceleration location or crush location and the deceleration rate and how these people would be contained within their seats or restrained within their seats, that the expected injury pattern would be very low.

Q Assuming that in 1983 this bus had been built with belts, what's your understanding of the type of laps -- the type of belt system that would have been included in this bus?

A Most likely it would have been a lap belt system as contemplated by Ward at the time, in fact prior to that time. I personally remember discussions with Charles Ward and with other engineers from the company when I visited the plant some time ago in working on cases in which Ward buses were involved.

In the discussion, my only preference would be a consideration of most of the occupants having restraint, three-point restraint systems. But that does require a different structural approach.

Q So two-point, a lap belt system is what would have been in this bus had the purchaser ordered the available seatbelts in 1983?

A That's kind of a loaded question. Or had the manufacturer made them available in all buses.

Q But I didn't ask you that. My question --

A But yours was partial, partially it was loaded. By the way, because that has a lot of assumptions, one of those assumptions is that you actually made the purchaser aware of lap belts. And I have knowledge through my own experience that that was not done.

Q Tell me what that means.

A It means that when the buses were sold, they weren't sold with lap belts or they were negatively sold, which was even worse.

Q What do you mean, negatively sold?

A They were, the salespeople approached the purchasers on the basis of "you don't want this system."

Q You don't have any knowledge of what was done in this-situation, do you?

A In this case, I do not have personal knowledge.

Q You mentioned something about conversations with Charles Ward and plant visits and some other knowledge about Ward buses. What was the context of that knowledge?

A I have looked at other buses that Ward has manufactured over the decades and certainly seen a change in structure and design. I have visited the plant. And when I went back to look for notes of that visit, I do not have them any longer.

My memory tells me that it was in the late '60s. It was an invitation. It was related to litigation cases and may have been tied in with, at that time it would have been

International Harvester. I may have gone to that area with International Harvester engineers. I do not recall the details. It was a busy time of my life.

And the third factor is I do remember meeting people by the name of Ward. Charles Ward I do remember although I couldn't -- I don't know if he's still alive or not, I'm assuming not -- I couldn't have picked his picture out of a gallery today. I do remember visiting what I believe was his home and having hors d'oeuvres and wine or beer or something. I do remember several children in the household at that time.

But I do remember discussions about restraint, quiet discussions, with one or two or three people, including an attorney for the company who I can vaguely picture, but I cannot remember his name.

Q Are you certain that that involved litigation and not some sort of other ultimate consulting?

A Certain? After 30 years is a long time. No, not certain. But my memory says that it was a number of factors we were looking into. I was deeply involved in school bus, motor coach and transit type bus research at that time, running large programs at UCLA. But I also was beginning to look into some litigation and had litigation cases involving school buses. There were some fire involvement. There was structure.

I do not remember any of those cases going to trial.

Q Do you have any sense of the subject matter that may have been involved in whatever you were doing, be it seatbelts, fire, other structural issues?

A There was deeper discussions about answering questions about various -- the catch word -- "crashworthiness" aspects to school buses. And I do recall the concern by the people in Conway as I remember it was located. I do recall their concern about structural improvement, crashworthiness improvement.

And I was in the process of beginning to prepare what later became a deep clinical study of buses, a paper that was published. I'm sure you've read it. If you haven't, I'd be surprised.

Q The 1971 paper?

A And I began to put that together, probably prior to. And I'm sure that they knew about it because I talked to various of the Chevrolet or GMC people and also the Navistar or International Harvester people about my involvement in the research paper.

Q Why is it that you think you would have talked to International Harvester people about bus research back in that period of time?

A Because, to my memory again, there were several buses, bus cases that I was looking at. Whether I was hired as a researcher for the corporation or a litigation matter, I do not recall. And I'm sure in those discussions I came out very candid about my opinions in terms of certain areas. They're expressed in my paper. Those opinions go back to the late '70s late -- late '50s rather -- when I looked at the first school bus accident that I was involved in in West Los Angeles. It was about '57, '58.

Q Has the seatbelt debate been raging since the late '50s? Actually, the school bus seatbelt debate?

A I wouldn't quite characterize it as raging. But certainly there has been discussion about the use of restraint systems on large buses because they've certainly been on small buses for a long, long time, effectively utilized and produced -- and reduced a lot of injuries.

Q I don't want to get too far off the topic. But when you say they've been used on small buses and reduced lots of injuries, what's the basis of that conclusion? I know they've been used, but what's the basis of the conclusion that they've reduced a lot of injuries?

A The literature that I've read, the case analyses that I've read, the experimental studies, and the anecdotal information I guess would be the other way of expressing it, all indicate the same level of effectiveness-in a van as it is in an airplane as it is in an automotive vehicle, whether it be truck or automobile.

Effectiveness of restraint systems has been around for a long time. In fact, I wrote about the effectiveness and delivered that information before Congress in the old Roberts

committee, commerce committee back in the late '50s. They are effective. Psychologically it's taken us a long time to get people to understand that.

Q Just sticking with small buses with belts, have you seen literature that's looked at the crash history of small buses and reported that it's made a significant difference?

A I don't know that there's been a summary paper that I'm aware of. I am aware that there have been some internal collection of information. But the case history analysis, my own personal experience with buses, smaller buses, whether they be yellow buses or blue buses or just straight vans for transportation, that information has shown the effectiveness to be just like any other vehicle. I mean that's, as far as I can see, obvious and realistic.

Q You're not aware of any literature though that said, "Here's a study of how small buses have performed in crashes with belted occupants"?

A No. I've heard about internal documentation but I do not, I have never to my knowledge -- at least I can't think of it right now -- seen any paper, any research paper, you know, qualified researcher I'm talking about, who has studied this on the van-bus.

I mean, it's the kind of thing that is relatively obvious as to what the results would be. And given limited research dollars, we don't go after obvious answers.

Q You said you heard about it internally. What did you mean?

A People talk. And I have heard that there have been manufacturers of bodies as well as manufacturers of chassis who have looked into the use of restraint systems in small buses. I'm also under the impression that there may be internal documentation within the Department of Transportation, but I have no access to that. Although I've asked about it, I have no access to it.

Now, that information, I have not talked to the current person, but in the past I've talked to people who have worked for DOT.

Q We're headed down the path I wasn't planning on. Way back, 15 minutes ago, I think I was asking you about what kind of belt you anticipated would have been in this bus had they been installed in 1983. And we agreed it would have been a lap belt I think.

A I'd say the most likely, with a high probability it would have been a lap type belt, yes.

Q And do you anticipate two belts per seating area or what?

A I don't know that I'd be the one to answer that, whether it would be. If the bus is sold as a six-row seat, six-passenger row, then I would anticipate that each person would be belted. If it was sold as a four-passenger row, then I would anticipate four belts.

Q And what would the nature of the lap belt system have been back then? Generally, what would it have appeared like?

A It would have been a floor-mounted with the anchorage on the floor. And whether it was a two-piece, four-piece system or how it was designed, there are all types of alternatives. I'd look at it more in terms of the performance characteristics rather than me try to tell somebody how to design the system.

There are too many creative people out there and there are too many creative potential solutions to offer too. But given that performance criteria approach, and then the testing approach, people are -- those people are so capable.

Q I guess I'm not trying to get you to suggest what a design should have been like. I don't mean to beat around the bush. What I'm trying to figure out is what would we have had in the event of all belted occupants in this crash at the moment that the crash ended and before rescue started?

A I'm not sure I understand that question. I can see it in a number of -- it's ambiguous for me. Are you talking about body location? Seat location? Upside down?

Q Body, seat, occupants, yeah. How would the occupants, if you looked at that bus before anybody went in there and started to rescue or before anyone inside did anything, what would we have seen at the end of this collision?

A Well, you know, it's a millisecond or two after it, there would have been people who would have had rotation. They would have been hanging upside down in their seats

and they would have started to release themselves, just like they do in those vans and vehicles that do have belts that are upside down. No different.

This happens. I mean, rollovers with vehicles coming to rest on the roofs is not an uncommon occurrence, especially with vans or with structures like this structure. So that, but that's if, that's what you're asking. Upside down, sure.

Q I'm trying to envision, I mean, we have a group of different size and ages and assorted children. They're lap belted. They're upside down. And they're at some distance, significant distance, from the ground or essentially from the floor in the vehicle because the vehicle is upside down.

Now, if they unlatched their belts by themselves, at that point what happens?

A They drop to the floor. They're athletic, those kids. Someone would certainly have had to have helped the handicapped boy if he had a physical handicap. If he had a mental handicap, maybe, maybe not. But that's not uncommon. I mean, that occurs a lot. Kids tumble and climb ropes and go on bars and bells and release themselves. And that's normal human activity.

I know what, I think I know where you're going at, but I think it's a nonsensical argument.

Q That's what I'm asking you. But is there any danger in the self-rescue process of a child releasing the belt at that point?

A I think a better way to ask that question is is it possible that someone could have gotten hurt in the release process, rather than dangerous. I think that's a legal word. Sure. It's possible that someone could have gotten hurt. However, one has to look at that versus what did really happen. Would the kids have been taken to the hospital for examination? Sure. But I don't think we would have had leg, arm, chin and the tragedy of the paraplegia.

Q And a three belt of this nature would have required adjustment by each student as they got in their belt and tightened it up so that it would fit them?

A Just like it would be today. Just like it was then. I mean, we had different systems perhaps and different elongation strengths. But they would have had to have been adjusted. But the kids do it all the time. This is the only system in the entire transportation mechanism or industry where we do not have restraints. Kids are knowledgeable starting at age 2, 3 years old. "Mommy, you forgot to belt me."

Q And if the bus had been equipped in 1983 with belts, then you're assuming in 1995 those belts still would have been there and been functional, or would they be new belts twelve years later or what?

A They might have to be replaced depending on the weathering and the chemical changes. But that's not unusual. Vehicles have belts that are replaced all the time if they last the 15 to 20 years that school buses last.

Q In 1983 are you aware of any manufacturer who offered lap belts or assorted belts as standard equipment for occupants?

A I'm not aware of it, which is a tragedy.

Q Do you know back in 1983 the percentage of new belts -- or the percentage of new, full-sized buses that would have been sold with passenger belts?

A I couldn't answer the first question. So I can't answer the second one.

Q I'm not sure what you mean.

A You asked me if any were sold, and I said I wasn't. So how can I answer the question of percentages?

Q I'm sorry. The first one is did anybody manufacture them as standard equipment? You said no.

A Sell them as standard equipment.

Q Right, build buses with standard equipment and you said no.

A Not that I'm aware of.

Q Second one was do you have any idea how many purchasers ordered belts on their buses?

A It's a slightly different question.

Q During that period of time?

A No.

Q I've seen the 1971 paper. I did not run across any other publications where you were an author or co-author that dealt directly with school buses or buses and belts. Did I miss anything?

A I published, until I left the research world, I published about fifty odd scientific articles. I tried to stay with a specific subject matter in each of the articles that I published. I felt that that one was quite complete, referencing school buses, motor coaches and transit buses. While that was not a seminal paper, it was responsible for a lot of changes in buses, roof boards, stanchions, pipe rail seats, although it fit into the thinking process at that time. I felt that it was complete.

Subsequent to that and before that time, there were a number of newspaper, magazine, journal articles about that time. And after the paper I delivered a number of lectures to the various pupil transportation manufacturing organizations of buses on the subject matter. I can't even tell you because thousands and thousands of lectures and talks. But I do remember a flurry of invitations and before various pupil transportation groups and National Association of Bus Manufacturers and that kind of nambo typo, just a whole bunch of them.

Again, we're going back nearly 30 years.

Q So we have the paper, and there were additional lectures?

A There were articles and talks, illustrated talks, and questions and answers and seminars. And that's probably how I got involved with the Ward people, although my memory tells me that it was prior to '71. But that may just be a memory lapse.

Q And the paper and all of that follow-up work would have related to all the issues on bus safety that may have been covered in the paper, for example? Not just seatbelts, of course, or restraint systems; is that correct?

A I think that's quite correct.

Q After that period of time, '71 and whatever lecture period of time followed that, did you continue to do any more research in this specific field? And when I say "specific," let's talk about seatbelts in school buses.

A I stayed with the university on a salaried position until the mid '70s, then went on with U.C. San Diego. The bus work that was coming up I was called in on a number of by the state agencies: Idaho, Montana, a bunch of the western states. I worked with Physicians for Automotive Safety, I was one of the founders of Action for Child Transportation Safety.

And in that, to that extent I did consult with various organizations on school bus accidents -- police departments, attorneys general -- but I did not contemplate writing an additional research paper because a lot of the cases by then were involved with litigation. And I was, you know, quote, restrained, unquote, from -- I was restrained from doing any work because of the litigation nature.

Q Did all those contacts that you were mentioning involve restraint systems in buses or just bus crashworthiness in general?

A There was always the issue of restraint that came into play because I do not remember at least any cases or any accidents that I was involved in ever going to trial. But they also were involved with fire and with side structure, the numbers of rivets, the types of fasteners, the types of glass. Particularly the roof structure was of deep importance and the, quote, match-boxing, unquote, of roofs.

Exit. I did do a paper about the same time on extrication in exiting, and I can't remember if I referenced school buses in that one. It was the state of the art for the International Compendium that was prepared in the '70s.

But certainly the general overall upgrading, the quality, crashworthiness quality of buses, restraint being part of the second collision, not the first collision, and also part of what I later coined or earlier coined the third collision, the body organ, such as this type of accident.

Q Have you testified in litigation involving seatbelts in school buses in either deposition or trial?

A To the best of my recollection, every case involving a van-bus or a large bus that I've been involved in has settled. Most of the cases that I have worked on, as you're probably aware, I do not do plaintiff crashworthiness product liability cases with two exceptions: school bus litigation involving a nonuse of seatbelts or the nonavailability, and also certain child restraint devices, which I have a history of starting that concept too.

But I have never seen one go to trial, whether it's defense or the plaintiff side.

Q Have you been retained in cases before where the issue was whether or not school buses should have had belts? Let's limit it to large school buses.

A Basically it's not that kind of question that I was asked to look at. I was asked to look at what if the bus did have a restraint system, what would the injury pattern have been. And to the best of my memory, I have never had a case go to trial. And I'm not even sure that depositions were taken.

It seems to me that -- my memory is not too bad -- but it seems to me that the cases settled either just prior to or during or I just don't remember a deposition except in Arizona. Well, when we say school buses, I'm also including church buses, which are basically school buses. And in the Southwest we use the same type of device to transport labor in the agricultural field. So the bus color may be yellow or green or blue, but it's basically the same type of bus that we've been discussing here, and I don't have a name for that except "school bus."

And in all of those cases, the best of my ability, they have settled. Now, there have been some van-buses that came close to going to trial. And I tried to go back in my records and I just don't go back that far.

Q I've seen your testimony before with reference to why you might handle a products liability case that involved a child safety seat but I haven't seen you comment on why you would be involved in a products liability case involving seatbelts in a school bus.

A My basic approach to, I do lots of plaintiffs' work. I turn down -- I analyze cases and I turn them back. And I do that on defense. The basic approach that I take is that since I was so deeply involved in a lot of the early work, I've watched changes that have taken place in the crashworthiness field from the Corvair days, prior to the Corvair days I guess.

But since that time, I feel that I can be more effective in the automotive and aircraft field by approaching a case on a strength and weakness basis. To do that, I have to have proprietary information, and as such -- where I know about skeletons in closets -- and as such, I don't feel ethically that I can approach the case against a manufacturer.

However, there were some terrible mistakes made in the selling of child restraint systems that should never have been sold. There have also been in my opinion this, as you called it, raging controversy. I don't think it's a raging controversy. I think it's mistaken on the basis of other issues.

But it's my opinion that we would have saved a number of lives, we would have had a large difference in the number of spinal cord injuries and brain injuries if we had had restraint systems. I further find it difficult to understand that in an educational medium, that we allow children to ride unrestrained when it is important in my opinion to use this as a teaching mechanism.

Now, 1970, 1980, 1990, as the proportional number of restraint systems become available in so many different kinds of vehicles, there has been a change. Today I believe this to be the only system around that does not have seatbelts, and I feel that that's an improper use of the educational process. And this isn't dispassionate, but certainly it's important to me because I see what we're talking about here happening frequently.

Q My question was why you testified in a restraint system case. Is that what you were answering?

A That's the overall, generalized, boring answer to that, that short question with a long answer. But I think I tried to get some philosophy out is what I tried to do.

Q The child restraint cases, I thought what I had read in the past related to child seats, or are we talking about child restraints in passenger cars and not child safety seats?

A Most of them are in the child seat areas; however, there are other issues with restraining children depending on the size of the child. I also wrote a paper that had a catalytic effect on child restraint back in the late '60s I think it was.

Q I don't want to get too far off on a tangent here, if you can tell me quickly whether this is where I'm headed. But were you involved in either research or litigation involving injuries to children from rear seat lap belts in pass cars?

A I have explored those areas and I did work on children in the rear seat. It was my suggestion over 40 years ago that children be placed in a seat in the center in the rear. I'm not sure what aspect you're talking about.

Q That still may be confusing here. There have been allegations that lap belts in the rear seats of passenger cars enhanced injuries to rear seat passengers, especially children. Were you involved in any of that litigation?

A The use of the word "enhanced" is wrong. Can children be injured if they're improperly restrained and too young? Those are questions that can be scientifically answered. There are cases where that has happened. People have inadvertently placed, well, I don't know that "inadvertently" is the rightward. People have placed children who were too young in lap belts and they have been injured.

Under certain high load conditions, whether it's in a child or an adult, one can be injured. But those are usually high load, 25, 30 G impacts. They submarine. There are a lot of factors that once were a problem for us. Today we build child seats to offset some of that. Booster seats, for example. We also build rear seats that do not allow submarining.

Q Have you testified before Congress or any government bodies or committees on the topic of seatbelts in school buses?

A Not with that specific subject in mind. Was it part of questions and answers in subject matter? Yes. The Southwestern states and then -- I do not recall. It's been a long time

since I testified in Washington and specifically put my name to a comment. I've found that being an advocate is not what I do. I attempt to stay away from that aspect of it. And the celebrity type of thing, I've found it not to be useful in my work.

Q So specifically with reference to FMVSS 222, you haven't been involved in the hearings or the analysis --

A No.

Q -- that's taken place over the years?

A Not by name. I worked through P.A.S. I worked through A.C.T.S. and several other organizations but not by name. In other words, I consulted with them, worked with magazines and other organizations. But I did not want my name used. I wanted to be a source and resource, but I did not want that name.

Q I used the word "raging debate" earlier and you obviously didn't agree with that choice of words. Can we agree that there has been a debate ongoing?

A I should explain myself too on that. The word "raging" really is what is probably appropriate. I find it objectionable because it's an emotional decision. It's an economic decision. It's a postural decision to avoid the use of restraint systems.

It's also negative education. And I like to approach, I prefer to approach the question on a factual, evidentiary, empirical basis. That's how I approach it. That's the only reason I question the word "raging." But you're probably right because it's mostly emotion.

Q So we can agree there's been at least an emotional debate? There are two sides to this issue, correct, at least?

A There is an argument. I don't know that theirs is, their one side is actually a side. It's a position, sure. What I'm trying to differentiate is I don't see the objectivity and so I have a difficulty.

That's why I bring it into the emotional level or the economic level rather than the question of Do belts reduce injuries? That's irrefutably yes. Do they do it in school buses? Irrefutably yes. So the side thing because as we've just discussed.

Q You obviously have a position that lines up with one side and you don't agree with the other side as you've just described; correct?

A I wouldn't describe it that way.

Q Describe it.

A I offer my advice and apply explanations and my objectivity, and it leads me to the conclusion that belts produce reduction in injury. And you can characterize it that way, but it's not an advocacy position. It may have been at one time in the early days when I was fighting for belts in all types of vehicles, but today it's as objective as one can be.

Q You said earlier in response to a question that if there had been belts in buses, there would have been lives saved, fewer spinal cord injuries and fewer brain injuries specifically.

A Well, as well as spleens and hearts and livers and all of those kinds of Class 4, AIS 4 to 5 type injuries. Now, that's not an eliminator. A belt does not eliminate injury. You can't take a dump truck running into the side of a school bus and expect not to, even with belts on, you're going to have injury under those circumstances. But I'm talking about a general rule, just as it happens in automobiles. General rule.

Q I want to try to use some time periods for a couple of questions, first of all, between 1977 and 1983. And the purpose of using that is to exclude the pre-'77 FMVSS buses and end my question at the manufacture date for this bus, 1983.

A When the VESC 6 party came into play was about the same time.

Q VESC 6 was pre-222, which is 1977. So after 1977 there were significant changes to buses, and then this bus was built in 1983. And I want to look at that window right now for a moment.

A Okay.

Q Are you aware of any published literature or data that would have covered that time period that listed lives saved, spinal cord injuries that would have been different, brain injuries, suggested empirical data for those conclusions that you just stated a little bit ago?

A I'm not aware of a published paper that specifically set out, by a qualified researcher, to look at that. There were, are, were statistical data available. National Safety Council had some. There were materials within the Department of Transportation that I don't know that they were published.

But I am not aware of a scientific paper or statistical paper in any of the literature. There may have been. I'm not aware of it. If it was produced, then I missed it, talking about the kinds of things that I used to discuss and showing comparisons.

Q Let me be more direct. You as a researcher have these opinions of lives would have been saved, spinal cord injuries and brain injuries would have been reduced in terms of numbers. How would somebody else form that same conclusion before 1983?

A The most obvious is not a statistical differentiation or a case comparison, but it's on the basis of clinical observation. And that was absolutely available in every accident that was recorded, whether it be a newspaper records or police reports. It was very obvious. It was discussed not only by myself, who was, you know, involved but many other people in the automotive injury medical field.

One of the leading exponent groups was the Physicians for Automotive Safety, Dr. Seymour Charles, a physician. Debra Prichard. Another man in the East Coast, New Jersey area whose name I can't think of right now, a dentist.

Q Yeager? Arthur Yeager?

A Art, correct, Art Yeager, who was very concerned about the facial injuries and the jaw injuries. There was a group of orthodontists. I think I referred to that in that '71 paper. There were lots of highly qualified people. Some were a little emotional. Annamarie Shelness, who was involved very strongly.

I don't have the chip in my brain right now that will let me pull out all of that stuff, but there were lots of people. There were senators. There were several senators, state

senators, and representatives in various parts of the country, notably in the East Coast area, who were giving out information.

There was incredible attendance by the bus people at these kinds of organizations. I remember meeting people. I remember various kinds of comments, depending on who the person was that you talked to.

Q When you say "clinical observation," do you mean people looked at specific crashes and said, "Gee, if there had been a belt there, that we wouldn't have had a death that we did have"?

A Not that simplistic. These were qualified people making the empirical observation as to what the differences in injury pattern would have been with and without restraint, the kinds of things that we move from pre-'77, still had problems with in the '77-83 period that you're talking about.

But we had made a giant leap in terms of structural integrity, welding, riveting, stanchion release, some energy absorption in seats, seat strength to floor mounts, the type of flooring that was used.

Some companies and I do believe that Ward, was in the forefront, were making changes of interest well before that time. Their own crash tests in the early '60s, '64, not a good follow-up in some respects, but the idea of making those changes, the way they locked their seat cushions down.

Difficult to understand why they didn't make the last step. Difficult.

Q You obviously have an opinion why that last step wasn't made. What's that opinion?

A I'm not certain of it because we're dealing with human activity. We're dealing with economic activity. We're dealing with people who were not perhaps sold on it. There was competition. If I do it and the government doesn't mandate it, then I'm out there with a thousand dollars more per bus and I'm not going to get as many orders, the same thing we went through with the automobile business and the same thing with the trucking business.

I've seen it in the aircraft field too when it comes to different kinds of restraint systems. And I don't know how to classify that, counselor, but there is that, well, I guess it's the same reason that people have to be sold life insurance instead of just going out and buying it. I don't know the psychological -- I'm not the psychologist that can give you these reasons. There are people who have written about the rationales or the irrationales.

Q Pre-1983 there were publications and there was testing where the results indicated that there could be some injury enhancement by use of a lap belt versus a nonlap-belted person; correct?

A No. There was, there were statements that were made to this effect but there was no research that I'm aware of of any enhancement to injury other than the classical if-you-wear-the-belt-improperly type of enhancement. But that's not the belt. That's the usage of the belt. This business about people striking kids with their belt buckles falls again into that.

Q I'm not talking about that.

A Okay.

Q I'm talking about higher head accelerations to a lap-belted child versus the nonlap-belted child.

A But that is, that's only one side. All you have to do is decrease the -- or increase the surface energy absorption characteristics or use a three-point belt.

Q You're answering the scientific question and I think my question was was there literature and testing out there that, if you read the conclusions, the conclusion was the lap-belted dummy had higher head accelerations, greater injury potential than the nonlap-belted dummy in certain situations?

A You'd have to show it to me because I don't think the comparisons were made with the head, with the H.I.C. values in a comparison basis against the same surface. But there was a great deal of utilization of an isolated number that became a way of -- I'm tired today and my mind's not working -- but a way of getting around the real question.

And that's why I differentiated by saying these were statements. This was not testimony or evidence. If you ask the question, could there be higher values, the answer is yes, there could be. But that can be mitigated by other scientific methods, mannerisms, procedures.

Q As we sit here today, you don't have a recollection that there were tests that actually demonstrated or publications that said there were tests that demonstrated higher H.I.C. values?

A Yes, but I think those are statements. I haven't -- you have to show me the evidence. But I have seen, I do remember that there were statements to that effect.

Q Do you maintain a bibliography of the history of seatbelt articles?

A No.

Q Have you ever done that?

A No.

Q If I said, if we, if I asked you, for example, if we considered all the publications on the pros and cons of seatbelts in full-sized school buses that were out there before 1983, could you give me a summary of that?

A No.

Q And have you ever maintained any kind of or put together any kind of documentation that would shed light on that question, for example? What was out there?

A What had been published by someone or statements?

Q Right.

A No.

Q If I asked you if the majority of writings or publications before 1983 advocated the use of belts or nonuse?

A In buses?

Q Yes.

A I would think that because of the letter-writing campaign, quote, approach to the nonuse, that there would be more written words about the nonuse. But I think the motivation that you've talked about before is what caused that.

Very seldom -- very often, pardon me -- in the scientific world it's the small voice crying for the real change and everybody, the giant voice, saying, "No, no, no. Here are the reasons we can't do this." We see it in the political, economic, social world all the time.

Q So whatever reasons were out there for the nonuse of belts, you consider them all to be in that category of political, social and whatever else you said?

A No, not all. There may have been a small bit of smoke burning but I think that smoke -- fire burning with a little bit of smoke. I think that it was looking at the event through false glasses, that it wasn't focusing on how do we reduce the injury consequences in school buses.

It was these belts can cause problems that are difficult, et cetera. Let's find out ways. Let's consciously or unconsciously determine ways not to put them in, because once we turn our attention as a scientific, as a public group of people, we can do anything. We can go to the moon. We can go to Mars. We can do whatever we want.

In the case that we're talking about, it's not a very expensive process to do it.

Q Before 1983 there were people whose primary function, their job was safety in student transportation, who advocated the position that belts should not be put in full-sized buses; correct?

A There were people who made those statements.

Q Same people who were working --

A By the way, I'm not sure that I agree with the premise that they were interested in student safety. They may have had that job title, but therein lies that knife-edged distinction that I've been speaking about with you about these social issues. And I think that's a very important differentiation.

Q I guess that's what I'm trying to get at. You're almost speaking softly as if there was some conspiracy to keep belts out of buses, and I'm trying to get you to tell me who it is and what it is that they were doing if that's in fact what you believe to be the case.

A No, I do not believe in a conspiracy theory at all. I think it was just easier. It's always easier to go the negative route than it is the positive route. It's always easier to look at the glass as being half empty than being half full.

And when you take the competitive aspect, for example, if there was, assume that there was a decision made in 19 pre-'77, all school buses shall have lap belts on, it would have been done. It would have taken the competition aspect out. It just would have been done. The cost is minuscule compared to what the cost is of one paraplegic person being thrown in the rollover type bus accident. It's minuscule. You could have equipped all the buses on the road today for what it would cost for this young lady I would assume.

That's not a conspiracy. It's some other type of psychological experience we're going through. And I'm not sure that I'm equipped by nature or mentally to tell you that aspect of it. But it is, if you come right down to it, it's a pretty dumb decision or lack of decisions that were made.

Q Did NHTSA consider and reject belts in school buses beginning as early as the early '70s and continuing up to today?

A For the same reasons we've been talking about. National Transportation Safety Board is just the other way. They're an advisory group and they say do it, the chairman.

Q Today they say do it. 1998, they say do it for the first time.

A But I happened to be working with those people all the way back into 1966, when that was the first bus accident that was ever scientifically analyzed. And that was the Nevada bus, the big fire bus. And we were talking then about belts.

But there was a group of people within the system, starting out with David Soule -- I never thought I'd remember that name -- as well as the current person who I have heard speak, who have a hobby horse and they're riding that hobby horse. They have a lot of pressures

from a lot of different kinds of people within the school bus transportation industry or the school transportation industry. These are areas of social concern.

I'm looking at it from the standpoint of lap belts reduce injury. Lap belts in school buses reduce injury, and that's what's important. And this child, Chadwick, eighteen-year-old -- she's not a child. -- was eighteen years old. She would not have had this injury if she had been restrained with a lap belt alone. I find that to be irrefutable.

Q You mentioned the NTSB. In the mid '80s the NTSB studied all of the serious bus accidents that they could find that occurred in a year-and-a-half or two-year period of time.

A I can't say that. It's my understanding that they probably analyzed to the best of their ability. They did make mistakes. They do make mistakes, interpretive mistakes. But it's my understanding that they did do some school buses. I've read some of the reports, yellow-covered reports. I haven't seen the one recently, but I have read them.

Q In the mid '80s did the NTSB in fact conclude that looking at a series of forty plus severe school bus accidents, half of which were rollovers, that seatbelts would not have made any difference in the number of fatalities or serious injuries that occurred?

A My memory is that I found it astounding then, and every time I think about it I find it astounding, the rationale with some of the people who worked on that program was shocking. Some of those people were qualified. Some of them were not qualified. Many of these people were not around shortly thereafter.

Q When you say that seatbelts would have saved lives, they would have reduced spinal cord injuries and they would have prevented brain injuries --

A I don't say "would." I say they do.

Q -- they do in school bus accidents, what empirical data is there out there that provides background to that statement?

A Just about everything we've talked about with respect to other vehicles. If it walks like a duck and it talks like a duck, et cetera, et cetera, et cetera, it is.

And to utilize this kind of concept as we go from a different size vehicle or configuration is just an application of the basic packaging principles that were laid down by -- memory again -- the man who committed suicide who was the World War I veteran who began to study -- memory is gone -- but his very concepts which led to restraint systems in aircraft and so on were, are just as true today as they were then.

You don't package a human body and leave it loose in the device that's going to roll or whatever. We know that.

Q Is any of that published with reference to school buses and seatbelts and the actual accident experiences?

A I'm not a librarian and I can't answer that. My understanding is absolutely. Is there a lot? No, because there aren't that many people speaking with a small voice.

Q Are there that many accidents from which to choose where there have been severe injuries in school buses?

A There are a lot of school bus accidents. The statistical data is difficult, but we seem to have about a doubling or tripling of the amount of injuries that are being recorded. Whether they were recorded at the time, ten, twenty years ago, I don't know. But the mileage driven doesn't seem to have increased.

When CNN did the program or programs and the analysis, we then created a group to look at the National Safety Council's statistics. That went nowhere. And the interesting comments were depending upon which hobby horse you were riding on.

Q Is the concept of compartmentalization effective in preventing severe injuries in the majority of crashes with school buses? Large school buses?

A Containment.

Q Let's just take with large school buses unless I give a different --

A The containment factor or restraint factor is important. Can compartmentalization help? Sure, depending on the crash. Tell me the crash, I'll tell you what to do. But given the fact that crashes can happen, weird ones and not so weird ones, the restraint

system is the best overall means of reducing injury. It has to have a good quality seat, but most seat backs today have better energy absorption than the seats of years ago.

Q Statistically if we look at the majority of crashes nonbelted, has this containment, compartmentalization, been effective in preventing serious injuries?

A Define "compartmentalization." Containment I understand. I'm not sure about compartmentalization.

Q Post-'77 seat spacing, seat height, seat padding, no belts.

A And your question again?

Q Has that design been effective in preventing the majority of severe injuries in school bus accidents?

A I don't think so.

Q Has it been effective in reducing the number of severe injuries in school bus accidents?

A Injuries, not severe. Usually a severe injury occurs in what I called years ago a Type 3 accident, which was an accident in which there was some rollover or some side impact so that people moved from the seat containment, or your term, compartmentalization. When it was a low speed, frontal type impact, of which are a large number, then the injury is usually facial.

Now, the modern seat has reduced that, the very modern seat, the very good energy-absorbing shield or seat has reduced that or can reduce it further. That does require lesser compartmentalization. But that's basically how we package people or package objects that we're going to mail and send.

Q How do you analyze whether a motor vehicle is safe from a second collision standpoint other than look at actual crash experiences?

A Usually the word "safe" is not utilized because that's a philosophical discussion. What is utilized or what is attempted, what we attempt to do is either to set a

performance level or to run a crash test and a series of crash tests using very sophisticated anthropomorphic dummies.

We then go into the real world to the best we can. The real world studies are not as effective today because they're not being done as well today as they once were being done. But it's usually performance criteria, once we understand something about human tolerance.

Q Can we agree that you cannot look at one accident and the injuries that occurred in that accident and analyze the product on that basis?

A I don't know that I totally agree with that. I would say that that is a point on a line and it may be a very significant point. But you cannot just throw out a single accident, not if you have people who understand crash mechanics, human tolerance, biomechanics, those subjects that are applicable to that subject. One accident can be very effective.

NTSB does it all the time. They make huge changes in what they suggest be done by the FAA, whether it's a railroad accident, a bridge accident, a school bus accident or what have you. It can be a very significant point on the line.

But it often takes, to make major economic decisions, it often takes more than one point but something that is so patently obvious. I mean, I hand you a knife. I turn that knife and hand it to you by the handle. You don't grab it by the knife blade because it's patently obvious. And we're into that kind of a discussion.

And yet we have this resistance, this monolithic resistance, to these kinds of objects. And I find-it part of humanity but a bad part because a belt being used by this girl would have eliminated the injury.

Q You read people who have published things on this topic, writings that say that seatbelts aren't cost effective in reducing injuries in accidents based on the number of accidents, the amount of severe injury, and the cost of equipping buses with belts; true?

A Ask Ms. Chadwick to answer that question. I find --

Q Now you're being emotional. I'm asking if you've heard that before.

A Sure I've heard those things, but that's nonsensical.

Q Why?

A Because one doesn't deal in a situation like this with the cost benefit aspect.

If it was your child, you tell me what you would do.

Q You're getting emotional again instead of being a scientist.

A I'm not getting emotional. I'm pulling your leg. I know where we're going on this thing, and those kinds of questions can be asked. They can be answered. But you really have to look at this child and this case.

Q As a scientist, when you're looking at product safety, do you consider the concept of an unreasonable risk of harm?

A That's legal language. That's not science language. I understand the concept. But because we get close to the jury's interpretation or the trier of fact's interpretation of what those words mean, I try to stay away from that.

Q So if I asked you if a bus without a belt presents an unreasonable risk of harm, that's beyond the scope of where you like to go in giving opinions?

A No. I would answer that question, of course. The problem is that, well, let me put it this way. I would use small letters, not capital letters for those words, those significant legal words. I think there's an unreasonable risk given an accident, with the potential of an accident.

Furthermore, very importantly, it is a negative educational approach. The reason we run fire drills, the reason we do these kinds of things is for education so that when something happens, we can reduce the consequence of that event. We put lap and shoulder belts in vehicles to reduce the potential consequence of an accident, those injuries.

Q You reminded me of something. For you to have reached the conclusion that a lap belt would have made a difference to Christina Chadwick in this accident, you also had to make the assumption that she would have worn the belt had it been available; true?

A That is true. And also it is my understanding that Mr. Miller, the driver, would have insisted that those kids wear the belts.

Q Statistically what you've seen from those states where seatbelts are required in all post-'70 or post-'87 buses, the numbers of students, who actually wear the belts, the percentage of students who actually wear the belts has been very, very low?

A I don't know the answer to those questions. I have not studied that area. I do know that the percentage of children who wear belts in their vehicles or in vehicles is very, very high.

Q Is it fair to say --

A Let's take a break for a minute or two.

Q Okay.

(whereupon, a recess was taken.)

Q BY MR. RENNIE: Let's classify something. If we're talking about school bus crashworthiness in general and we're looking at accident history, would you agree with me that we have to sort of draw a line at pre-'77 and post-FMVSS 200 series that started in 1977?

A I was about to say yes, but I don't know how loaded that question is. I don't know how subtle you're being about it. There was a dramatic difference when the structural changes took place. No question about it, the buses are better today.

The injury-production, producing nature of the post-'77 or the '77 bus plus is much better. There were some pretty bad pieces of junk on the road.

Q Let me be more specific. If we're trying to look at how people, how students-fared in a crash in a pre-'77 bus versus a bus manufactured between '77 and '83, you would expect that between '77 and '83 the buses were more crashworthy and students would have fared better as a general proposition?

A I think it's more than just expectation. I think that the results clinically, because there's not been a good statistical or multi-level study of school buses, pupil transportation, but clinically there's no question in my mind, there was a dramatic difference.

Q And a pre-'77 bus with lap belts?

A Pre-'77 with lap belts, okay.

Q Actually, that's a bad question.

A I was wondering how you were going to get around that.

Q Let me, what I'm trying to say is a bus with 1977 improvements compared to the pre-'77 improvements.

A Compared to the pre-'77 bus, because there's the word "improvements."

Q Yes. Pre-'77 bus -- strike that.

What I'm trying to get at, before 1983, if you were looking at statistics of how buses performed in crashes to determine whether or not lap belts should be added, you would have to separate your research kind of at that pre-'77, post-'77 area; is that fair?

A Well, I guess I can think about that in several ways. I believe that clinically -- because you can't do it statistically. It's not been done. So it can't have been done. To go back now and try to find pre-'77 buses would be very difficult.

I studied those pre-'77 buses. It was my conclusion that in a number of those buses the lap belt would have made a difference provided the anchorage was strong enough. There were some bad flooring designs and, of course, there were bad seat mounting. But even with the inadequacies of the structural design, the belt would have made a difference in whenever you got side, lateral, rollover type forces.

Now, in those buses with the pipe rail seats and lap belts, I don't think there would have been -- there would have been a reduction in the injury in the frontal impact, but that wasn't a function of the belt. That was a function of the seat and the nature of the seats.

Q Without lap belts, there still would have been significant injury reduction in the post-'77 vehicles as compared to pre-'77?

A In my opinion there was clinically reduction, not in the Type 3 accidents though and not in the significant Type 2 accidents where you had multiple types of loads. In the lower type frontal impact, of which there are more, the '77 plus bus had made major changes.

But you have to look at the accident sequence. The Type 3 is infrequent, but it's the one that kills, maims and injures. And it's the headlines around the country. We had one today in California, a head-on crash not too far from where I live. I don't know the results that took place. I'm hoping that the bus was just insignificantly involved

Q When you say "infrequent," less than five percent of all crashes?

A I don't know. There are a lot of bus accidents that are not recorded.

Q Certainly not the severe ones though?

A Yes. For one reason or another they do not become part of the statistical chain. That's the church bus -- they're not classified as school buses but they are -- the agricultural bus, which we have a lot of, I mean huge numbers of them. They're blue or green instead of yellow. Those are not recorded in the school bus statistics.

Q You've used the word a couple of times "clinically." I'm not quite -- I need to know how you, what you mean when you say that.

A It's a very good question. It's important. There is no one studying, or was no one studying because there may be groups today, studying the type of bus that we're referring to -- the school, church, labor bus, ag bus -- from a classical statistical sampling basis in terms of the structural performance and the numbers of injuries.

But each and every bus accident can be studied on an individual or clinical approach, single approach or small number approach, just like the NTSB does with certain kinds of accidents. And we did speak about the enormous amount of information that comes from that clinical, single, dual, small number of accidents that are studied. One can gain considerable information. That's how we got to the '77 difference because these were clinical.

That paper that I was producing and those discussions that I was lecturing at UCLA was a monument to the studies at that time because of our crash program that started in the '50s and because of my clinical program, myself and my physician co-director. So we were sources of information. People came to us constantly, talking about. And ours was a clinical study, not a statistical study.

Q That study in '71, if I remember correctly, there were no -- you did not look at any rollover accidents that involved school buses. They were all -- what do you call them? Metro sort of buses or motor coaches; is that right? I'm not testing you. That's my recollection. I didn't go back.

A My memory is not that good right now. I have not reviewed that paper in detail in a long time. So I don't know the answer to your question.

I do know that there were cases that were buses that may have influenced -- bus accidents that might have influenced some of the conclusions that were not given case histories for a number of different reasons that yet were part of the Gestalt -- what's the word I'm looking for? -- the overall source of information. But I and my coauthors could not write about them specifically, but yet it influenced our thought process.

But I don't know the answer to your question.

Q If a concerned party before 1983 was trying to look at the type of injuries that occurred in school bus accidents, paraplegia as a reported injury would be, paraplegia or quadriplegia would be a minuscule number, minuscule percentage of the reported injuries; is that fair?

A Not really because from an epidemiological standpoint, I cannot remember the first, the dates of these papers, but there was one very powerful paper, one very significant paper that summarized a lot of the research, epidemiological research, that indicated spinal cord injuries, concentrating on that, that it was either 50 percent or more than 50 percent of all surviving spinal cord injuries. Jess Krause, golly, how one remembers things. Krause, I think that was his name, produced some really interesting work indicating that motor vehicle accidents accounted for 50 or more than 50 percent of all spinal cord injuries.

That was a very well done epidemiological study. I don't even know if Jess is still alive.

Q That wasn't limited to school buses though?

A No. But it's indicative of how many paraplegic or quad injuries in school buses. I doubt if 'we could tell you anywhere close to the number because there were no studies being done. No one was looking at the statistical. There were a few of us looking at the clinical aspect of school bus accidents.

We were so deeply involved with the large numbers of automobiles, the large numbers of motorcycles that became very significant injury-costly in the '60s. I think we got up to five, six, seven thousand deaths alone, let alone the tens of thousands of motorcycle accidents.

So statistically the bus is not involved in a large number of accidents, thank God. But when you take the school bus, the ag bus, the church bus, the motor coach and the transit bus, there's a lot. But what the number is nobody knows, and I doubt if anyone still knows. There's no good sampling study at this time being done that I know of except I hear something within the DOT. But the man that I asked the question of who didn't know who I was said no, it's not being done. And yet I get anecdotal information that it is being done.

Q So pre-'93 you're saying there may have been injuries?

A '83.

Q Pre-'83 the injuries may have been out there, but they just weren't reported?

A They were. But what the magnitude of those injuries were, the only thing I know is that, coming around the other corner, is that 50 percent or more of all traffic accidents accounted -- I'm sorry all spinal cord injuries, 50 percent of spinal cord injuries were from motor vehicle accidents. And so how one asks that question is very important.

Q Again, I'm not trying to test you, but I don't recall in the paper that you did in 1971 that there was reference to quadriplegia or paraplegia injuries in a school bus accident even though we're talking about pre-'77 buses.

A I don't remember either. I just, that was a sampling of what? A dozen or so, in ten to a dozen of exemplar areas of how and the conclusions, how these buses crashed and the conclusions that could be drawn to make changes for the future. It was a catalytic type of paper I

thought. Now, there was thinking about these changes, you know, at the time that paper was produced.

Q I covered this a little bit earlier, but you understand that belts were an option available to the purchaser at the time this bus was built in 1983?

A Interesting question as put. That's declaratory. Whether or not the purchasers knew that is questionable. There were a lot of purchasers who bought buses not knowing that there was even such a thing available. That's anecdotal. That's my experience.

You would have to ask the purchasers if they could remember what they were given 20 years ago.

Q In 1983 the state of Arkansas had specifications as to what was required of any person purchasing a school bus. Are you aware of that?

A Yeah, minimums. They had to include this kind of a mirror, and if you had this sort of thing, it had to fit that. All states had that to some degree or other.

Q And this was well into the years when the debate about seatbelts in school buses had been going on; correct?

A But I don't know that the purchasers knew about the debate.

Q Are you suggesting that they didn't know that a school district director of transportation wouldn't have been aware or that the state, any state director of transportation wouldn't have been aware that seatbelts were optional equipment?

A And the question is am I suggesting that? I don't know the answer to that. I only know the following: That there were a number of people even today who are not aware that belts are an option available.

Q Wouldn't you say -- tell me what you're talking about. I don't understand that. Who? Where?

A It's rather remarkable and, again, this is anecdotal, this is personal, as one goes and talks to people on school boards, "What do you mean, belts are available?" to the question, "Did you order those buses with, school buses with belts?"

"What do you mean belts are available?"

I mean, that happened to me somewhere between, well, it was '98 sometime, maybe a year or so ago, I can't be sure, in this state in a large school district in a discussion with a school board member.

Q A school board member wouldn't necessarily have the job of being the transportation director, the person responsible. They might sign off on the allocation of funds.

A That's right. And so there wasn't even a question in their mind. They didn't see it. But those are questions you'd have to ask people who were buying, if we're staying with this bus in '83 in that part of Arkansas.

Q I guess it would be your opinion that the state of Arkansas would have been at fault in 1983 for not requiring belts as part of their specification?

A I don't know that I would be the person to answer that question.

Q Why not?

A I do know that, just like one does not buy life insurance, once is sold life insurance, that the buyer has to know about and be sold on it. And whether that buyer is the state or school board member or the pupil transportation person, I've been through that with the automotive field.

In the automotive field I feel that it is the responsibility to a large extent of the person who manufactures the device to sell the guard on the belt or the drill press, safety aspect, that it's not necessarily the user.

And to that extent, I guess I'm somewhat plaintiff-oriented in this approach, but it's the person that has the knowledge of what is important that has to make that available to the user, whether it's a purchaser, user or what have you. And I think that's fundamental humanity.

Q In 1983 what knowledge did the manufacturer have that belts would have made a significant difference to the number and severity of school bus injuries that occurred?

A I can't really answer the first part of the question. Take the significant number out. Did that manufacturer have the knowledge that seatbelts make a difference? Yes, of course. Nobody had the information about the numbers because there was no statistical data. It was all anecdotal or clinical. So you can't answer the question.

It's like Lewis Carroll's how can I have more tea if I haven't had any? But they did know that belts made a difference. That they did know.

Q In 1983 would a manufacturer also have read that seatbelts could enhance injuries? Lap belts could enhance injuries to students?

A Could they have read that?

Q Yes.

A I read lots of things that are untrue. The world is going to die. It's going to explode tomorrow. There's lots of stuff out there. One has to use their common sense as well as their scientific. These are not dumb people, manufacturers. They make good quality equipment, currently or after '77. These are not -- these are rational people.

They know what -- they knew what -- their decision may have been made on other reasons, but they knew the efficacy of restraint systems.

Q Was there literature published about crash testing that occurred before 1983 where the results indicated that lap belts in school buses could cause injury as well as reduce injury?

A I just don't know. You'd have to point me to it. I do know that there was significant information about ejection, about loose bodies, about our work in '67 with the UCLA bus studies as well as the UCLA other studies.

I can't tell you how many bus manufacturers were at those crash tests. I remember meeting some. My memory of '67 people when I was so involved in the program is limited, but there were people there who talked about the value of belts, the question-and-answer aspect.

At that time we said, "Hey, unless the seats are better, you can't have belts in there." But we showed some -- gosh, how many different seat structures were tested? Fifteen? Eighteen? Given the good seat, the belt is important. That was the conclusion.

And then I followed up with a clinical study several years later. I finished some of the analysis and published it. And it was a heel-and-toe thing. Yes, belts worked given the quality of seat, compartmentalized in your term. The child, the students with the belt on him and you reduce the consequences of the injury, the severity of it.

Q Pre-'83 were there publications that indicated that there was a potential for abdominal injuries to children who were wearing lap belts?

A If improperly utilized. We talked about that three times already, yes. If you allow, if you have a belt on and you're sitting in a car like I'm sitting now in a vehicle.

Q If I've asked it three times then maybe you did not hear my question because my question has nothing to do with children. I want to know about school buses and I want to know if before 1983, you're aware that there were publications that said there is a danger of causing abdominal injuries to children by putting belts, lap belts on them in school buses?

A I don't know the answer to the specific question; however, there's more to it than that. It's not a yes or no. It's a yes or no but.

Q Remember, I'm not asking about the science. I'm asking you about what was out there in terms of what somebody could read.

A Just because something is published doesn't mean it's true. You have to use your common sense. These are people who have common sense and rational minds and other motivations.

Q What did that mean at the end, "and other motivations." I feel like we're back to a conspiracy.

A Because they may have chose not to -- not conspiracy -- they just may have chosen to believe something which in their heart or their mind or their soul or wherever it was, they didn't believe. But it gave them a rationale, an excuse, to take a particular position.

One of the things that -- my position and my usage and my thoughts about belt and my answering your questions is that I was there. I was involved with the people who were making these decisions. I listened to that irrationality and I talked to those people. Now, some of the people were not.

My memory tells me that a few, including Mr. Ward, Charles Ward, memory tells me that he was a very good thinker, confused and wanted answers and talked a little bit. But there were a lot of people that I talked to that were there. I heard them with their motivations. I saw their smiles. It makes a difference when you're actually in the position of having discussed these issues, these comments, these thoughts with those people who were decision-makers then.

Q You're still mystifying me when you say things like the people who in their hearts, their minds and their souls didn't believe what they ended up doing. Why do you say that?

A Because I heard folks say, "You may be right, but it's too costly."

And I'd say, "\$50 a student over a 20-year period of time is too costly?" when at that time maybe it was a million dollars or a million and a half to store a vegetablized individual with a brain injury, that it cost whatever it cost to fix a broken leg or a broken arm. That's what I'm saying. That there were people who had motivations that were not based on healthy-mindedness. They had other approaches.

Q Is the motivation that you're talking about then, this dark motivation, always a cost motivation that you're saying?

A I don't know the answer to it but I do know that cost was a factor in decision-making, even when we would say, "Gee, what's the average life of a school bus? Ten years? Twenty years? You're buying something in 1970 that will be put on the salvage block in 1990. It's going to cost you \$42.36 for that. And even if you have to replace it after ten years for weathering and so on, all your fixtures are in. It's just a matter of snapping in a new system."

I remember those discussions, and I remember the answers.

Q Do you recall that, for example, in 1972 there was a published NHTSA report, School Bus Seat Restraint and Seat Anchorage Systems, that the authors were Wojcik and Sandes or Sanders, where the conclusion was that lap-belted school children had a risk that was unacceptable in crashes and that the use of lap belts in school buses was inadvisable at the time?

A When was that paper published?

Q 1972.

A I think that was a function of the seat structure. I think I remember that paper. Again, I have not seen or read that paper in a long, long time. But it was a function of the then-existing type of seat structure that we found in our clinical study of accidents and also in the '67 experimental crashes where the seats let go.

But if you take the conclusion in the context of what was being studied for that particular narrow, narrow box, that would be a proper conclusion. But the box was too narrow. And I think I remember discussing that with one of those authors, although I don't know. It may have been at a STAPP or AAAM meeting.

Q There was something in the Severy publications, the publication regarding the '67 crash tests or '66 crash tests that I thought was an indication that in order for belts to be effective, 100 percent use of the belts was required. Can you explain a little bit more why that conclusion was reached?

First of all, is that a conclusion that makes any sense to you at all?

A Maybe if I reread that aspect of it.

Q Let me see if I can try to clarify it a little bit. I thought what was being said was if you have a system where belts are available; but let's say 50 percent of the students wear them and 50 percent of the students don't, you set up a situation where one student is lap-belted in front of a student who's not lap-belted. And the nonlap-belted person, as they decel in the crash, may actually end up then enhancing the person who is lap-belted as they crush down that person's seat back, and it would have been better off under that limited circumstance if both had been unbelted. Therefore, the belted person wouldn't have been injured by the unbelted person.

A Not the latter. The latter was never concluded, that both should be unbelted. But there was discussion amongst all kinds of transportation that a loose object in the back seat behind the person who was restrained could produce injury.

In fact, I argued with the automobile industry, General Motors and Fisher Body. They were concerned even putting shoulder belts in the front seats and laps in the back. And I said, "Put the damn shoulder belts in the front too if you're concerned about that." It took some years before we got there, but that's peripheral. That's epicyclic type of study.

That is not to the main issue that you can sell belts and you can sell the use of belts. And that's the kind of half class bull approach that we need, not the fact that because of these minor aspects of negativity, that we say -- that we don't do anything.

Q Southwest Research Institute, is that an organization that you're familiar with?

A Some. Obviously, I know the organization. I worked with some of the people. I've talked to some of their people. I've been there and lectured. Southwest.

Q It's a California organization; right?

A That's the one at that time, I'm trying to think of the director, assistant director. I'm sorry. People moved around at that time. So I can't tell you who the director was.

Q It's one of these pre-'83 sort of studies that I was trying to ask you about the motivation behind.

A Which one?

Q There's one in 1977 Southwest Research institute had done for the California Highway Patrol, a studying relating to seatbelts for use in buses. And the conclusion was seatbelts should not be installed in school buses. School buses were very safe. No need to install belts. Cost wasn't an issue, one of the factors raised there.

Are you familiar with that particular study, for example?

A Only having read it years ago, I read that thing, I talked to the -- let's see. Who did I talk to? I'm sorry. Looking at the author listing on that, I may be able to tell you who I talked to. One of the senior people.

And the logic that led them to that conclusion I thought was really obtuse, but I cannot remember any more than that. So it would really be unfair to ask me anything about it. I think that in the narrow box that they were referring to, they were wrong, unlike the other people that were right within their narrow box. I thought they just had a very, very shallow approach to that subject matter.

Q Do you think a school district purchasing a bus in 1983 should have anticipated the risk of an accident that would have led to paraplegia?

A If they didn't, they had their head in the sand or any serious, critical injury. Sure. They had their head in the sand if they didn't anticipate they'd be involved. That's why they carried insurance or took on assumed risk themselves. That's why they carried their own automobile insurance because they assumed that they would be involved.

Q Why would a school district carry \$50,000 of liability insurance then in 1995 with that kind of information?

A That's not a question I can answer because I think it's stupid if they did something like that. They will carry \$500,000 on their own car but they won't carry \$50,000 on their buses.

Q Before 1983 were there investigations of bus accidents reported where the investigators reached a conclusion that if there had been belts and passengers had been belted in these particular accidents, more fatalities or more severe injuries would have occurred?

A Might have been. I mean, you get a side impact as I said earlier with a dump truck. And whether you have a belt on or not, you can be seriously hurt or killed just by the penetration aspect and the magnitude of forces. I mean, it could have been, sure. It could have been.

Q I'm not saying that they would have been killed whether they had been wearing belts or not. I'm saying beyond that, situations reported where there had been, where the investigator said if these people had been belted, they wouldn't have survived, where they did survive without being belted?

A I have no idea. There are all levels of analytic ability. You go to someone who really knows what they're talking about in the medical field and you can get a different answer than if you go to a general practitioner.

Q Let's look at that specific question. Don't you agree that it's likely there were some accidents where that very situation occurred? People were able to escape from the area of greatest intrusion or happened to be thrown away from the area that ultimately ended up in having greater intrusion?

A Well, from my standpoint, without seeing the actual information, that would be -- sure, I could assume that. But I don't know that it has any real value.

Q What about situations -- strike that.

Are you aware of a report pre-1983 where a bus that was on fire, where the fact that students weren't belted was cited as a factor in allowing more of them to escape?

A That's nonsense. People escape because they're conscious. Belts keep people conscious. Belts reduce the consequences that allow people to escape. That whole extrication process is based on psychological fears of fire and drowning. I used to have all of that in the automotive field. You still get it a little bit.

But that's nonsense. It really is. It shows the inadequacy of the thinking process or the naivete. Could it be true? Of course. But those kinds of comments or statements made generally show naivete in the understanding of the sequence of the events. Not only during the crash, that very short, short interval of time, but they just don't understand the crash mechanics and forces involved.

I've heard those kinds of statements all my professional career. And it could be, yes, but I think it's nonsensical. I'm not trying to set myself up as the know-it-all. I'm

just saying that having been around for so long and watched the changes, some of which have been so painstakingly slow. Look how long it took us to do it in the child restraint device field. We're still working on it.

Q Let's look at it in the context of a manufacturer in 1983, not you as a scientist, but weighing belts versus nonbelts and looking at what they saw out there. And you say on one hand they had information that would have been derived from, I think you cited two things at least, the '67, '66 crash tests and your paper in 1971. Maybe some lectures or something that you would have given.

A And so many newspaper articles and so many local --

Q This is pre-1983?

A Pre-1983 and I'll even say pre-1975 if you want to. Those people knew what was going on. Those people in the management, decision-making process knew what was taking place.

Q And those people would also have been weighing what you put on one side of the scale versus other publications and tests that said, for example, belts can enhance injuries, belts might cause abdominal injuries to young children. There are situations where had there been people belted in certain accidents, the investigators believe there would have been higher number of deaths, greater number of severe I injuries. Belts have other potential drawbacks that you might consider to be emotional or whatever, vandalism, not high use, things of that nature.

Wasn't there two sides to the story back then?

A And now.

Q And now.

A One side is basically irrational and one side is basically healthy. And if I choose to take the healthy side, that which reduces the consequences of the accident, the injury production, that's the decision that is the proper decision to be made. Now, it's an economic decision in part. And I think that all of the things-on the one side -- you didn't bring in cost.

Q I should have. I should have thrown cost in there.

A And competition. I think that's the motivating factor. It was not the healthy-mindedness. It was not looking -- we did the same thing with the automobile. People gave us the same arguments. Today we have a vehicle that is absolutely incredible compared to the vehicle of the 1960s.

Q Let me just carry on with that a little bit farther. Why should somebody have accepted your position versus other literature that came to a different conclusion? You act like it's so simple. To you as a scientist perhaps, yes. But to the person who wrote about higher head accelerations in crash tests or potential for abdominal injuries and one percent of the accidents involving severe injuries, considering the overall safety record of school buses, why should they have reached your conclusion versus --

A That question is a nice dispassionate question, assuming that there is rationality and no other motivations. But the decisions were not made on rationality. Decisions were made on cost and competition.

The decisions may have been somewhat confused, but there were a number of people out there in the medical, engineering fields saying, Look at this aspect. Look at this aspect. This is what makes a difference. If we fix the seats and we fix the shell so that it is a reasonable crashworthiness, whatever that means, so that it doesn't tear apart, then what do we have to do with the pieces of glass inside that shipping container? We need to make sure that those pieces of glass do not shift, do not bang against each other or the sidewalls.

And those were the decisions or those were the areas they chose not to make because they said nobody else is doing it. Nobody else is doing it. Why should I do it? I'll put myself at a 1200 or a 500, or whatever the cost was, disadvantage. And this is a competitive business, Siegel. We've got to make sure that our prices are the same.

Q That's the only issue? That's the only cost issue?

A It's not the only one. But it's the rationality of it. Injury reduction was not dismissed. It was avoided because it was too easy to go the negative route. It's tough to be, I thought the Ward Company was going to be the leader. I really did.

I felt very comfortable after my visits, and I thought they would move ahead. Whatever voices prevailed within the company, I'm sure it would have been nice to have been a fly on the wall in that particular series of meetings. But it was not a dispassionate, you cannot make a dispassionate answer to it because I wasn't there.

But I was there when people talked to me because I can remember the questions from the audience.

"How are we going to add \$100 a month to the cost of cleaning those belts when somebody throws up on the belts?"

I said, "How do you clean the bus up now when somebody throws up on it? If I had you pay for all the orthodontial work, don't you think that thousands of dollars would" -- and we would go on and on.

But when you have a set position like many people did at that period of time, they didn't want to do it. They just didn't want to do it. Neither the -- and the manufacturers said, Hey, I'm not going to add \$500 to mine and not have them be used.

It's a concept. It's a system.

Q The manufacturer, Ward wouldn't make money if they put seatbelts in the buses; right?

A Would not?

Q Would make money. They would make more money.

A Depends. General Motors gave away child restraint devices at less than their cost for a number of years, the infant carriers that we helped design. Could Ward have made money? I don't know. Those are not areas....

Q You keep saying "cost." You must be talking about somebody other than the manufacturer then because the manufacturer makes a profit by adding seatbelts to buses; correct?

A Yeah. But if his device, if his widget is one-half of one percent more costly, it's a highly competitive field. Supposedly everything else is equal, then the purchaser is going to go for the one that doesn't have the half percent increase.

Q So in this

A And that's only one factor. You still have to have a system. You have to convince the user, the child, the student, the pupil transportation person, the maintenance person, the driver. You've got to make it a systematic approach. But you've got to start out with the device in the vehicle.

 And who better knows what real differences occur than the intelligent person who makes the thing? The same argument with the automobile. It wasn't until certain people within the transportation industry came to the conclusion, hey, this is the way to go.

Q You're suggesting that like in 1983 -- do you know the process by which this bus was purchased through the Hughes School District?

A No.

Q Are you aware that the state would require the school district to put out bids, to say, Here's what 'we want?

A I would assume that they accept the purchase order and you bid on the purchase order.

Q You're assuming then that if Ward was the only manufacturer that offered belts back in 1983, and of course their product was therefore more expensive, that they would have lost probably the bid and not been able to sell the bus?

A Not necessarily because people will buy a quality useful device, whatever it might be, if they're sold on it. We see that all the time if the dolor is right and it hits the emotional spot. If the manufacturer went out and said, Look, these really do make a difference, we think you should, here is why, that's a pretty patently obvious sales approach to school buses.

 They're not doing it. They're not doing it today.

Q They ignored some of the literature that was on the other side of your position?

A They ignored the rationality. They saw that in every other device belts are coming in. Lap-shoulder belts, lap belts were part of the Automotive Manufacturers Standardization in 1965. They didn't do it for government reasons. There was no DOT.

Manufacturers began to use belts in the '50s. They saw the rationality. The slight increase in profit was almost nothing in the early days. The only regulation that ever came into play was that if belts were being put in cars, and it's January 1st, 1968 that they should be lap-shoulder belts in the front seat. Everything else was from the automotive manufacturers standpoint. And it was sold to the public on a systematic basis.

The bus industry did not do that, and yet the bus industry people I talked to in the manufacturing field and the people transportation field knew that. We talked about it.

Q There's another cost issue that's been discussed on a broad basis. And that is, if you have a limited number of dollars available to purchase your vehicle and to improve safety and so on, then the dollars have to go towards getting the best return. And if in fact you got a list of ten safety items and seatbelts produce the lowest return on safety versus the other nine, then you spend your money, you start at the top of the list and spend the money until the money runs out and you have nothing left when it gets to seatbelts.

A That's assuming that there are nine things ahead of the seatbelts. But you also make the tacit assumption that if you have an injury, you're going to pay for it. If you're going to self-insure, you're going to self-insure. You may not make that consciously, but it's there. And to any manufacturer, he knows it's there because there has been a heavy, heavy world of responsibility in terms of the product you put into commerce.

Q I don't mean the manufacturer necessarily. I'm talking about the customer, if the customer has a limited budget.

A Same with the customer. The customer, you may then have to pay for that in one way or the other, either in breakdown or maintenance or other factors. But these are

getting a little bit far afield of the generalized safety area. Remember, I do work in the mechanism of injury and death. And I do know that lap and shoulder belts make a difference. That's why I'm here.

Q I understand. That's why you're on one side of the scale here.

A I'm not sure that you can characterize it that way. But that's really, I don't look at it in terms of us and them. I look at it in terms of what is important in terms of injury-reducing. That's why I'm here. You're asking me questions and I'm giving you opinions and thoughts that are, at least they're thoughtful because I've been there for a long period of time. But I'm not the psychologist to interpret other people's motivations.

However, I do know that belts work and would have in this particular case. And whoever bought that risk has bought that risk.

Q I'm not sure that's exactly what I was asking you, but my question was more directed to the fact that reasonable persons could come to a different conclusion because there were factors that they looked at that you simply don't agree with as being important.

A That is, in a general sense, quite true. But when you were there and you saw the irrationality of that decision-making process, it's not that reasonable men didn't come to different conclusions. It's the process by which you get to those conclusions.

And the decision to go negative is not the rational, reasonable man approach. There was choices of why they went negative, not to do something. There's a big difference there.

Q Are you suggesting that you've considered all the other reasons that were raised and are still raised by the people who are not seatbelt advocates and you can say in your position that these are not reasonable decisions on their part?

A Nicely put question, very well addressed. No. The answer is no. But parts of it are certainly true. In fact, I don't find somebody who is against seatbelts anymore or the concept of the seatbelt. It's not the reason. It's not "I'm against seatbelts because they don't work." You never see or hear that, at least you never hear it today amongst people in the know.

There are other reasons they feel, and you'll see that. The competition, cost factor, and then the scare-them-up type issues come to play. But when you look at an individual who has been in an accident and has been thrown from the seat and is severely injured, a belt will make a difference.

Q I think you answered this but you tell me if you have or not. Didn't I ask you earlier why NHTSA never, in all the years that they've considered this, reached the conclusion that seatbelts should be required? Have I covered that?

A I think we have.

Q Summarize the work you've done in this case for me quickly.

A I don't know how many times I've looked into the case. I haven't billed on it yet. So I don't know how many hours I've put in.

Q I was going to ask you how many hours generally you've put in.

A I'm not sure. I probably have used up the advance that I was sent.

Q Which was?

A \$5,000. I don't know. I don't know the answer to that. I've reviewed as much material as we've discussed earlier. I do intend to review the rest of the material in the next couple of weeks. And I will probably not make a special trip to the area, Memphis, Hughes area, Arkansas area.

I probably will not look at the scene and the vehicle because I understand it's been cannibalized. And so that tells me I may not get very much out of it. Photographs are pretty good.

Q Do you plan on just looking at it right before you testify?

A I don't like to do that for the obvious reasons that you'll bat me on the head with it. But in this particular case, since it had already been cannibalized and the area had been somewhat changed, there wasn't a great deal that I got involved with --what? --three years after the accident to really rush out immediately and go to the scene. It was what? April '95, the accident. So it was almost three years to the date afterwards that I was first contacted.

Q We're almost done. Let me just ask you a couple of specific things out of the paper. I'll read you the quote. Then I'll give it to you to look at so it's not out of context. This is on the second page.

 "Future changes must be based on a demonstration of payoff potential through knowledge of injury production modes and patterns."

A Sounds like my co-author.

Q What is that?