



Vehicle Technology – You Ain't Seen Nothin' Yet
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(The following may contain unintelligible or misunderstood words due to the recording quality.)

BILL HAAS: Morning, everyone. Well, I have to say a special thanks to John. Your presentation was great. And it couldn't have been a better way to start on what we're gonna talk about in the next 45 minutes or so.

Folks, what I'm gonna do this morning is give you a *Reader's Digest* version of a much larger seminar that I've been presenting around the country for about the last nine or ten months. And we're gonna look at new vehicle technologies that are either currently offered; they may be in development. And we're gonna talk about a few that we'll probably never even see. So you might ask yourself: Why does this guy run around the country and talk about vehicle technology primarily to shops and service technicians? Well, the answer's simple: Because vehicle technology directly impacts the profitability of the shop. If they don't embrace the technology, aren't prepared for what's coming down the pipe, they'll be out of business. They'll fail to realize the profits that they need just to stay in and grow their business.

Let me give you an example. In your business have you ever watched an employee undertake a task that they weren't prepared for? What happens? It's disruptive to your business and it's a money-losing proposition. So it's

really key that we have to have technicians and service shops prepared for what's coming around the corner.

Now, when I present this seminar to shop owners and technicians I always preface it with this: The information that I present is intended to intrigue curious minds in hopes that they'll seek additional information in preparation for the future. The purpose is not to scare or intimidate. But, you know, sometimes we have to remember where we came from before we can look ahead. And I think John had a term for it, you know, like, selectively forgetting the past.

Well, do you remember the good old days? There's something from our past. Life was simple sort of. I think. That's about a 1981 Chevrolet Citation. What did that car mean to our industry? Well, if you think about that car and you look at what it did technology-wise, it was unibody construction. The engine sat the wrong way. The front of the engine was on the side. The side was on the front or something like that. It had computer-controlled ignition timing and air-fuel ratio of the fuel system. They had taken the differential and put it in the transmission. I mean, my goodness, what were they thinking of?

And so when I present this to shops I ask them if they were part of the evolution or part of the revolution. Because, see, that's what was happening in the industry at the time. You could either evolve -- you could either embrace the technology and evolve -- and you would still be in the business today -- or you had been part of the revolution. And the revolution was this: The revolt was I'm all done. That's enough. No more. I'm not gonna do front-wheel

drive cars. I'm not gonna do computerized-engine systems. And those shops eventually faded away and don't exist today. So we really need shops to evolve and accept those technologies. And, see, that's part of the profitability thing. If they evolve they're still profitable.

A couple quick examples: I think of what was happening back in the 1980s. And if we're gonna talk about preparing technicians and service shops for the future, let's think about this. Electronic ignition came along. All of a sudden we had vehicles with HEI distributors in them. These things were just monsters all of a sudden dropped on to of a V8 engine for instance. And what happened in the industry? We had technicians and service shops that weren't prepared for the technology. So the first car that showed up at the shop with a no start that had an HEI distributor in it, what did the shop do? They pulled out the distributor. They went to the salvage yard. They got a points-and-condenser distributor; dropped it in; set the timing to 40 degrees before top dead center; wired it to a coil; started the car and fixed it. Because they didn't understand the technology of a module and a reluctor.

And not only that but, unfortunately at that time, they also told the consumer that we not only fixed the car, we made it better. How did -- come on. We made it better? We were regressing in technology and trying to sell it as improving.

The first cars with torque-converter clutches. The car'd be going about 28 miles an hour. The torque-converter clutch would engage and there'd be a little chuggle on the steering wheel and it would drive the consumer crazy. They'd go into the shop and they fixed it by unplugging the torque converter at

the side of the transmission.

Well, now we've seen technology, you know, advance to a level that those kinds of things aren't gonna work for us anymore. We can't take a car with distributor-less ignition and add a distributor to it. It's impossible. So now they've had to, you know, start to learn the technology. So our industry has never been without change, never.

But let me give you one quick example. There's one company that I'm aware of. I understand that Robert Bosch Company applies for 14 patents a day. That's just a measure of the rate of change our industry is experiencing now. And it's not gonna slow down. So it's not rocket science -- or is it? Well, I'll bet the auto industry could give NASA a run for their money.

You hear the story so often about the first, you know, manned spaceships that went into orbit that had two or three or four computers. I don't remember exactly the number on 'em. That's nothing compared to what we're seeing in our industry.

So let's take a look at things that go fast, stop quickly, improve fuel economy, address some environmental issues and more. How about this, there's the Mercedes-Benz SLR Coupe.

By the way, David Caracci, thanks for allowing me to use that picture of your car.

This thing's a rocket. Here it is powered by a supercharge 5.5 liter, 617 horsepower V8 engine, that achieves a top speed of 206 miles an hour. There are 230 control modules on this vehicle. They're controlling systems. They're interfacing with one another. They're sharing data between the control

modules. Now, granted, I don't know that many service shops are gonna see this particular vehicle anytime soon. This car happens to come with a \$497,000 price tag. But what I do know is this, we're gonna see the technology from this vehicle migrate into other vehicles that either already in the service bay or will be there tomorrow. There's no doubt in my mind.

By the way, if it happens to show up at the shop, it has to be lifted with a calibrated lift. If you don't, you'll break it. Not on seriously break it, but you will damage the chassis and the body because of the way it was built. And if you can afford the car you can probably afford to pay the \$3,000 gas guzzler tax that's due at the dealership upon delivery. You've gotta love that.

And how about this? There's the Bugatti Veyron. That's the spoiler or air brake for a Bugatti Veyron. Now, if you wanna talk about fast, this car goes from 0 to 60 to 0 -- right -- 0 to 60 to 0 in less than five seconds. At 124 miles an hour when you apply the brakes, in four/tenths of a second that spoiler will stand up to 55 degrees and the passengers will experience six/tenths of a g-force on their body. Now, at 250 miles per hour the combination of the air brake, the four-wheel carbon ceramic brake rotors, eight-piston front calipers, six-piston rear calipers will stop this car from 250 miles an hour in less the ten seconds.

Ladies and gentlemen, I'm ready to go back into the service business. All I wanna do is test drive these things.

There's the Cadillac 16 Concept introduced about four years ago at the Detroit Auto Show. Pretty good looking car. By the way, if you look at the front end of that thing you can see where some of the new Cadillac look has

come from, can't you? Cadillac planned to build this car. The key word there was "planned" to build this car to compete with high-end European luxury cars like the SLR Coupe. This was gonna be Cadillac's answer. This is how we could compete in that market.

And this is the XV16. This was the concept engine that was in the Cadillac 16. Now, this was like taking two Chevrolet V8 engines and putting them together end to end. This thing was enormous. And it had some technology in it as well. It had titanium valves. It had variable camshaft timing. It had displacement on demand. I guess when you have 16 cylinders you could shut a few off sometimes. This engine will never see production.

Because what happened was in the last Congress -- if you can recall when our last Congress revised the CAFE Standards that are gonna take effect in 2020, General Motors' remark when they heard that that legislation had passed was, "That kills the 16." In other words, the fuel economy of this car with very limited production was so poor that it would take the corporate average fuel economy down to a point that they could no longer build the car. Now, we all know that the standard for 2020 for CAFE is gonna be 35 miles per gallon. That's gonna be across the board for cars, light trucks and SUVs. That's not that far away.

But I think you'll find this interesting. Do you know what 35 -- do you know averaging 35 miles per gallon means to this country? It's estimated that will be a savings of 1.2 billion barrels of oil a day. That's what 35 miles per gallon means to this country. That's why technology has become so important. And then we have automakers that are already committing resources to meet

those standards. They have cars like the Lexus LS600hL [sic]. This is the hybrid version.

And I didn't tell you at the beginning of this, besides talking about some car stuff I might on occasion throw in some of Bill Haas' opinion. So here's a little bit. What's the cost of that technology? Well, here's what it is when you look at this car. This car is available both as a gasoline version and a hybrid version. The cost of the technology is about \$42,000. The price of the gasoline version is about \$63,000, the hybrid's \$102,000; and so there's a \$42,000 differential. So the question that I ask is: How much gasoline do we have to save for this to make sense? The answer is nobody knows. I think it's about impossible. So that becomes tough for consumers as well. All right?

And this isn't your typical hybrid. I mean, we're used to the Prius and the Insight. And we're -- you know, we've seen the Accord with the hybrid powertrain. But this isn't your typical hybrid. This hybrid has 438 horsepower and will go from 0 to 60 in 5.5 seconds. For a hybrid that's a hot rod. And this is also the car -- if you've seen the advertisements for the car that'll parallel park itself, this is it, the advanced guided parking system. It's a \$3,800 option that should've been available when I was teaching my daughter to drive.

Now, another piece of recent news from Toyota and Lexus is the development of an exhaust sensor. And this is an exhaust sensor that actually senses the level of exhaust in the interior of the car. What they want -- what they're going to do with this technology is when the vehicle's stopped in traffic and the exhaust level inside the cabin of the car gets too high, it's gonna automatically switch the air conditioning system on to recirculate and

automatically roll up the power windows, so that we don't have people getting sick from the exhaust fumes while they're stopped in traffic.

And this is from -- believe me, I'm not picking on Toyota. But I'll get to the rest as well. But Toyota has also developed -- or developing an alcohol detection system. This system is actually incorporated pads into the steering wheel that will detect your blood alcohol level from the sweat in the palms of your hands. And if it's too high the vehicle doesn't start. Or if it were to increase while the vehicle's being driven, it will actually slow the car down and shut it off and not allow the car to restart.

And this system incorporates -- besides the sweat pads it'll also incorporate sensors in the steering so it'll detect erratic steering in conjunction with an infrared camera that's above the visor that will determine if your pupils are focused or not. So any of those things could potentially prevent the car from starting or bring the vehicle -- slow it down and cause it to shut off and not restart. There was originally -- when this was talked about just a few years ago it was talked about that this would be available and introduced in the United States by 2009, and now it looks like they've run into a few glitches and that's not gonna happen quite that quick.

Now, on the diesel side this is interesting. We now have selective catalytic reduction or some people refer to it as diesel exhaust fluid. This is the technology that allows diesels to meet the near zero NOx emissions requirement and achieve improved fuel efficiency at the same time. See, this has been the big challenge for diesel manufacturers in the past. They could have the best of either world but not both. They could either have a diesel

engine that provided great fuel economy and was a gross polluter or they could develop diesel technology that was very clean and the fuel economy was really poor.

Well, what they've done with selective catalytic reduction is -- and by the way, if you're not familiar with NOx, NOx is actually nitrogen oxide. That's if you go into a metropolitan area with a high-vehicle population and you see that kind of brown haze up in the sky, that's NOx. That's what we're talking about.

Well, what they're doing now is they in this system they're using diesel exhaust fluid, which is purified water and urea. Urea is medical grade urine. And it's stored in a tank. And what they do is they actually mist it into the catalytic converter over the hot catalyst. And it turns NOx into nitrogen and water vapor, which go out the tailpipe and, of course, nobody has any issues with that. So now we can have diesels that will provide great fuel economy, be very clean -- which they must because in 2010, next year, the requirement for NOx emissions is about that close to zero. It's zero without saying zero I guess is the best way to put it. All right?

It's already been introduced. Mercedes-Benz has got three models that are for sale in the country now. They've got the R, the ML and the GL320 series. Those are pictures of 'em. They're doing the -- they call their system Blue Tech, so if you hear anybody call -- you know, refer to Blue Tech, that's what Mercedes-Benz is talking about. It's stored in a tank that's in the left rear quarter, right below that quarter glass.

Now, this isn't like when you go to the service station and buy fuel you

have to fill up the urea tank or the blue tech tank. The idea is that this would be serviced at a normal service interval, so when the car goes in for its normal maintenance of blue boil filter, tire rotation, that kind of thing, the tank is then replenished at that point.

What I would point out to you, though, is if the car were ever in a rear-end collision and someone would, you know, come into that left rear quarter panel and break open that plastic tank that's holding the diesel exhaust fluid, we could break the tank open and we could have diesel exhaust fluid into the interior of the automobile. We could have it on the head liner, the carpet, the back of the rear seat and all that kind of thing.

And immediately I know it comes to your minds, he just said its medical grade urine and this stuffs gonna really smell. It's not it. The real problem is this: There's nothing known at this time that will remove the stain of diesel exhaust fluid. So in the collision repair industry they have to prepare for writing estimate sheets on these cars and including any of those components inside that got diesel exhaust fluid on; a piece of carpeting, a head liner, a trim panel or anything like that because they're not able to remove the stain.

It's interesting in this diesel technology that Mercedes-Benz has with their diesel they have, for instance in the ML, which is available as both a gas and a diesel, when they do the performance ratings on 'em, either car, as far as power range and acceleration they are absolutely the equivalent. You don't notice any difference in driving those vehicles regardless of what powertrain's in it.

On the transmission side of things, this is a pretty cool deal. We now a direct-shift gearbox. We have six speeds available already in Audi and Volkswagen. BMW introduced a seven speed in their 2008 M3 model. What's unique about this is they're running two individual input shafts. And so they'll have a set of gears, first, third and fifth on one input shaft. You'll have second, fourth and sixth on another input shaft.

And what it allows them to do is pre-engage a gear on the stationary input shaft and they use the clutch to just engage and disengage the input shafts. So the gear's pre-selected when they make the upshift or the downshift. So there's no torque interrupt on the shifts, so we stay right in the power band that we wanna stay within on the engine. And they can accomplish that shift in eight milliseconds. Now, what's interesting to me is this isn't new technology. This was developed by Porsche back in the 70s. But what makes it work today is the addition of electronic controls.

Of recent news, everybody saw the talks that were going on between Chrysler and Fiat. And direct-shift gearbox was one of the technologies that Fiat was offering to Chrysler should that merger actually happen.

Rear-wheel drive, we're now gone to eight-speed automatic transmissions. There's actually Mercedes-Benz is about to release a nine-speed automatic transmission. What I find really unique about this is these transmissions have been developed in adding speeds, they're not changing the size of the transmission or any of the external fittings. So from the manufacturer's standpoint they don't have to change the chassis, the drive-shaft length, cross-member locations or any of this kind of thing. They can just go

directly into the next generation of transmission.

Just to give you an idea, you know, why are we headed this way, what's the advantage of all these additional speeds. When we compare an eight-speed to a six-speed, we improve fuel economy by 6 percent. When we compare an eight-speed to the old five-speed, we improve fuel economy by 14 percent. So it's all being driven by fuel economy again. The Lexus that we looked at earlier has an eight-speed automatic transmission.

It has a computer that's just really phenomenal. The computer for that eight-speed automatic transmission in the Lexus will actually adjust -- modify shift patterns to driving conditions. So, for instance, if the rain sensor on the windshield determines that it's raining, it'll tell the transmission computer the road must be wet because we're turning on the windshield wipers. It'll delay upshifts, okay, because we're now driving on wet pavement. It can modify the shift pattern to the driver. So, for instance, in David Caracci's Lexus, it'll determine whether David's the driver or Mary's the driver and change the shift pattern according. 'Cause I understand she's quite a racer, David. And it will also compensate for internal wear in the transmission. As there's internal wear in the transmission, the computer will compensate for that, as well, and prolong the life of the transmission.

One other thing I'll add quickly on the transmission side, that we are now seeing transmissions into the market that don't have dipsticks. You know the days of opening the hood and going out and pulling the dipstick and wiping it off and putting it back in to get a reading? It now requires a special tool. We don't just measure the fluid level but we're also having to monitor the

transmission fluid temperature through a scan tool. That's how critical the fluid levels become in these transmissions, so that's technology that the technicians are having to deal with on a regular basis.

And then there's this, the 2009 Corvette ZR1, or the Blue Devil. I just learned this myself about two weeks ago. The reason that car got nicknamed the Blue Devil is the lead engineer on the team to develop the car was a graduate of Duke. That's how it got tagged the Blue Devil. And hopefully was a gas scholarship recipient I hope. But that car has some unique features to it. It has a carbon-fiber fender, hood, rockers, the front splitter, the roof, the roof bar are all made of carbon fiber. And carbon fiber, of course, is very strong and light weight.

One of the things that I think is intriguing about this car is this car will tell you when to change the brake pads. We actually have a message center on the dash that comes up and says, "Change the brake pads," because they are the brakes.

I mentioned earlier the Bugatti Veyron with the carbon ceramic rotors. Well, this is a carbon ceramic rotor. That's what it looks like. The brakes on the Corvette, on the ZR1, actually have six-piston front calipers, four-piston rear calipers. And this brake assembly is actually two-tenths of an inch smaller than the Veyron brakes.

Now, when you look at the fact that -- for instance I'll just pick on Porsche. Porsche has a carbon ceramic brake option on all their vehicles today. And that option is \$10,000. So if we think about \$2,500 a corner, we could probably get a pretty good idea of what that brake rotor might cost. And

there's probably very good reason we're gonna wanna replace the pads before it does any damage to a rotor.

The 2010 Toyota Prius, this is what it's gonna look like. It'll be for sale this fall. That's gone through a major redesign. One of the things that technicians are gonna have to deal with with the Prius technology is we now have an air conditioning compressor that's running on 202 volts. That's not uncommon. We're seeing a lot of electric compressors. This one at 202 volts requires a special refrigerant oil. We can't run the old PEG oil that we were used to in our R134 systems. It's such a big deal that if you run a PEG oil in this system you will damage the compressor and the inverter. The last time I checked, an inverter is about \$3,400.

Probably a good time to give you just a quick update on air conditioning. We are actually watching the EPA go through the process of approving the next generation of refrigerant. It looks like we're on the verge of having a refrigerant that's called HFO1234yf. And I didn't make that up. Okay. It will be the first time that the EPA has approved a flammable gas for use in a mobile air conditioning system in this country.

Now, there's one last hurdle for them to get through. Right now that's still illegal in three states, so they've got some work to do. But unfortunately right now we're watching the EPA trying to figure out how they continue through the process. And we've got the car companies over here waiting to hear what are they gonna do and how are we gonna do it, what do we need to do. It's gonna be a little bit different than what we experienced the last time. If you'll recall, when we made the switch from R12 to 134a that was like

somebody just went to the wall and flipped a switch. As of this date everything changed and that was it. And, of course, we all believed R12 was gonna -- we were gonna run out and it would go away. And we can still buy it today and probably a lot of you still sell it today.

But what they're talking about now with going to 1234yf is that that will be phased in in stages. When a car manufacturer introduces a new model of car, it will require the new refrigerant. When they go through a major redesign of a model -- which happens typically every five to six years -- in that major redesign they will have to incorporate the new refrigerant. So it's gonna be a little bit different than what we've seen in the past.

Again, we're gonna have issues with tools and equipment to prevent cross-contamination. It's gonna require additional recovery, recycle and recharging stations. They have told us -- both the folks that work on the identification side and the leak detection side -- that the equipment that exists today is updateable, so that's one good piece of news. So that's something to look forward to and keep watching with regard to air conditioning.

This is the Lincoln C Concept that was introduced at the Auto Show this year. I've put a big red X in the middle of the steering wheel because something's missing. There's no center pad in the steering wheel anymore. That steering wheel is stationary. You no longer turn the steering wheel to turn the steer wheels of the car. And that's actually turning is an outer ring that is electrically connected to the steer wheel motor to turn the vehicle. The purpose of that was this: The dashboard's become a message center and Lincoln believed that they needed to have -- the operator needed to have an

unobstructed view of the dashboard. And so that's how they accomplished that, they just took the center hub out of the steering wheel. So now we just have an outer ring on the outside that turns. Very different than way we've seen in the past.

Also at the Auto Show this year was the Chrysler 200C Concept. You can see they've changed their steering wheel a little, nothing like the Lincoln did. What I really want to point out to you with this is the dash. The dash is actually a touch screen. There's no knobs, no switches, no dials, no buttons. The entire dash, if you wanna change any function is done in the touch screen.

The technology also incorporates a Smartphone to where you can change any of that functionality, as well, with your Smartphone. You don't have to even touch the dash if you don't want to. I don't know what that means when your passenger has a touch phone and he's starting to change stuff for you. You know, it could be some fun going on a road trip with one of those.

The technology in this car is also incorporated that you will have the ability through your cell phone to view the interior of the car before you unlock the doors or enter it. So you know what the inside of the car looks like before you ever get in it.

What's that? Come on, you all know what that is. You've been hearing about it for three years now. The Chevy Volt, right? Remember? You know, we've been seeing pictures of that thing for about three years now. This is the electric car. This is what General Motors is staking their future on. It's kind of like it's this or we don't know what else. Was with an engineer from General Motors last week. He's actually on the team that's developed the Volt. They're

working around the clock. They don't stop. That's how important this vehicle's become to them.

Wouldn't you find it interesting that General Motors started doing full-page advertisements in USA Today on July 12th, 2007, for a vehicle that wasn't even in production yet or available for sale? But see, they were trying to send a message to the consumer, weren't they, to America's public that we're a green company. We're doing the right things.

So if that's the Volt what's this? That's the Volt. That's the production Volt. Kinda looks like a Malibu to me. What happened? How did we go from that -- I mean, honestly, I kinda like that. I'd drive that car. Not saying I won't drive that one. But what happened? That's the result of 400 hours in the wind tunnel. They improved the coefficient of drag on this car by 30 percent. So this is what you're gonna see produced. When this car's for sale next year, this is what we're gonna buy. Actually, this is what they hope we're gonna buy.

This is an electric car. You'll plug it in at home to a 110 receptacle and charge the battery. You can unplug the car and you can drive it for a range of about 40 miles. But it also has a 1.4 liter internal combustion engine that doesn't power the vehicle but it operates a generator to recharge the battery pack in the car. So the full range of the car between a fully charged battery and a tank of fuel is a little over 300 miles, depending upon how it's driven.

Now, here's some more of that Bill Haas opinion. They estimate today that car will retail for about \$40,000. Is that really a solution for the average consumer today? I don't know.

Well, there were some things about the Concept that we don't know yet

if they're gonna carry over to the production car or not. And actually there were some pretty cool stuff. The car was gonna have no glass in it. The roof and all the windows were gonna be Lexan. The fenders and hood were -- actually GE Plastics had developed a composite material from recycled plastic bottles that were gonna be used for the hood and the fenders. Nobody can tell us yet today from a production standpoint whether that stuff's gonna carry over or not.

And then one of the biggest challenges for technicians is the vehicle has a wiring harness that's made of non-halogenated plastic. Well, see, in an electric vehicle you cannot afford to have corrosion anywhere. And by using non-halogenated plastic in the wiring harness it's very resistant to corrosion, which we can't afford to have in any circuits within the automobile. But it also was a savings of about 25 percent when compared to a conventional stranded-copper wire/vinyl-coated wiring in the car, so the savings of weight was huge as well. But what we do know already is it's gonna be something new the technicians are gonna have to learn as far as diagnostic testing and repairing of wiring harnesses and connectors.

And there's another electric car. There's the Fisker Karma. It's not for sale yet either. They're actually taking orders. It's an \$80,000 automobile. You can order it today. It'll be delivered in 2010. They expect to sell 15,000 in their first year of production. And the news -- the big news from Fisker about three months ago was they were looking for 40 dealers in the United States. So if anybody's looking for an opportunity you might be able to get in on the ground level for selling Fiskers.

This vehicle has a solar panel roof. So you not only plug it into the receptacle to charge up the battery -- by the way, the first 50 miles of driving is with zero emissions. But it has a solar panel roof. And the solar panel roof does actually two things. One is to replenish the energy in the power pack. And the other is to control the climate in the interior of the car. So if on a July afternoon in Dallas I were to park the car in the mall parking lot at noon and it was 72 degrees in the car and I came back out at 5:00 and it happened to be 102 degrees ambient temperature, normally when I would open the car door it would be like, whoa, just about knock you over. Not in the Fisker. When I come back at 4:30 in the afternoon and open the door it's gonna still be 72 degrees in the cabin of the vehicle.

You can also get an option for a solar panel that's available for the roof of your garage or your house, so that during the day you can capture that energy in your solar panel. When you come home at night and plug the car in you'll actually have a low-cost method with, you know, no energy source to replenish the battery in the power pack.

Now, I'm not saying I have all the answers but sometimes I have questions. And my question is: Does the electric car make sense when more than half the electricity in this country is generated by coal, the dirtiest of all fossil fuels. We might wanna stop and think about that before we go so far down this path.

You know, and then people will say to me -- they'll say, "Bill, you don't understand." That happens to me a lot believe it or not. They'll say, "We're gonna plug the car in at night when consumption is very low. Anybody think

about the infrastructure of the electric grid in this country? Will it support millions of people plugging in electric cars? And by the way, if you talk to the people at the electric company, they'll remind you that we shut the grid down - - portions of the grid down at night 'cause that's the only opportunity we have to perform any maintenance on the grid.

And then this to me is really startling. You know, if you think about carbon dioxide and the other gases that have been added to the air by industry and other activities, that's the stuff that we keep blaming on, you know, rising temperatures and, you know, changes in climate and weather. Carbon emissions grew by nine-tenths of a percent per year in the 1990s. They have grown by 3.5 percent per year since the year 2000. So some of that stuff is really, you know, things we need to look at before we go too far down the path. I believe. My opinion, again.

And then there's this. What do you do when you open the fuel door of a vehicle like that and see that? Where do you put the unleaded nozzle? Well, you don't because that's the Honda FCX Clarity which runs on hydrogen. It's available today. This isn't that far down the road. You can buy this today in three cities in Southern California. Well, actually that was a mistake. You can't buy the car. It can only be leased. You lease it for \$600 a month for three years. The lease includes everything, including maintenance -- even collision repair. If you go out and crash the car, you take it back to the authorized Honda dealer to be repaired. And it's not that they're trying to cut anybody out of the market. They're just trying to understand what's gonna happen to this car when it's involved in a crash. What other systems and

functions are gonna have to be addressed when it gets wrecked. Okay?

They're storing hydrogen in the back of the car in what was typically the trunk area at about 5,000 psi. And you can drive this car at a top speed of 100 miles an hour with zero emissions. All you're gonna do is get drips of water out the tailpipe from the fuel cell.

So what about hydrogen? You know, that's the first thing that comes to people's minds when you wanna talk about hydrogen. Everybody's perception is, oh, my gosh. They wanna go back to 1937 and think about, you know, the tragic accident in the Hindenburg. Hydrogen wasn't the cause of the problem with the Hindenburg, was it? Hydrogen was only in the vessel to keep it afloat. It was really pilot error. Pilot error is what caused the airship to strike a tower and create a spark that ignited the outer material, which had unfortunately been treated with a highly flammable solution to protect it from the environment. That's what caused the fire.

But, see, we're still gonna have to get beyond people's perceptions, aren't we? And so we're gonna have to address some things for consumers. We're gonna have to, you know, get people to understand that hydrogen is far more likely to burn than explode. It's renewable and it's abundant. Nine million tons are produced in the United States every year. Hydrogen -- here's a state -- hydrogen is two -- this came from -- I won't tell you who it came from. They said, "Hydrogen is too dangerous an explosive to use as a fuel." They said the same thing about gasoline a century ago. And we work around it safely every day. So there are some things that we're gonna have to address.

But there's things we know about hydrogen that if we can get beyond

some of this perception it might be okay. If hydrogen burns, it burns rapidly. It only emits one-tenth the heat of a hydrocarbon fire. Okay. There's a lot of hydrogen safety standards and codes that are in existence already today. As we spend more time with hydrogen, it'll be just like gasoline. It'll just become an every day occurrence.

But there are some things that are -- there are some challenges as well. People are funny. They're gonna expect to drive that hydrogen-powered car just like they drive their gasoline. There's gonna be an expectation of how the car performs. When I step on the accelerator I expect it to accelerate just like my Lexus or my Honda or my Cadillac did. Correct? All right? Right now that's not the case. That has to be -- that's an area that has to be improved.

They have to optimize on-board storage. In other words, I have to be able to drive the car far enough that it makes sense to have the car. There's gonna be an expectation that if I'm gonna go anywhere in the car I still wanna be able to put the dog and two kids and some suitcases in the trunk to make the trip. If I can't do that it might not be practical.

We have to know that there will be a viable infrastructure within the country that makes it practical for people to have these cars and operate 'em. Now, there are already claims that by 2012 there will be an infrastructure on both coasts. They're talking about 30 fueling stations within the Los Angeles metropolitan market, with ten fueling stations to destination corridors of San Diego, Palm Springs, Santa Barbara, Las Vegas. So I could leave Los Angeles, go to Las Vegas for the weekend, refuel and get back home. They're talking on the east coast of having 30 stations in Metropolitan New York City

with ten fueling stations and destination corridors to Boston, Baltimore, Washington, D.C., Philadelphia. That's only a little over two years from now. Sounds like there's some work to do and hopefully that can all get handled.

We have -- John touched on this earlier -- vehicle-to-vehicle communications. These are all the kinds of things that car companies are already working on. I mean, we're already comfortable at the shop level with computers in vehicles talking to other computers. Now we're looking at computers in one car talking to another car, so in this General Motors likes to call it V-to-V engineering.

In this particular example you have a car in the front that's slowing down and the car behind it continues to approach it at a faster rate of speed. The computers are communicating and so the car in front actually starts to flash the backup and the stop lamps to get the attention of the driver. If that doesn't work there's an audible alarm that goes on if I get within a certain distance. Well, after the audible alarm goes off, if I still continue to approach the car it will actually vibrate the seat. In case I've fallen asleep it'll try to shake me and wake me up. And if I get within the range of the red icon, it applies the brakes and will stop the car so I do not hit the car in front of me.

That's actually a look at how they're doing it. This is currently on a hundred Cadillacs in General Motors. One example up in the upper left is a pod with a monitor in it. The other one is they actually can embed the icon right on the windshield of the vehicle.

And this is the BMW GINA. GINA stands for Geometry and Infinite Adaptations. BMW challenged a group of engineers six years ago to use their

creativity and innovation and this is what they came back with. That is a body of seamless fabric that's stretched over a metal, moveable frame, so that from the driver's compartment you can change the shape of the car. If you want wider fenders or a higher rear deck, you can actually do that from the interior of the car. It's a polyurethane Lycra fabric that's translucent so the brake lights and tail lamps actually shine through the material in the back of the car. There's a slit in the hood to access the engine.

They built this on a Z8 chassis with a V8 engine and a six-speed transmission. And they drove it straight to the BMW museum in Zurich. And they claim they'll never produce it. But in case some day, somewhere, you see the car with the cloth body, you can say you saw it at GAAS first.

And let me close with this. This is from Lee Iacocca, the author of a book called Where Have All the Leaders Gone. And in the book Lee said, "The most successful business man is the man who holds onto the old just as long as it's good and grabs the new just as soon as it's better." And that's what change does. Those that will embrace it, accept it, are gonna be better. They'll be successful and they'll be here in the future.

No one wants to return to the days of the 1981 Chevrolet Citation. Do we? I hope not. Okay. You know, speaking of Lee Iacocca, I think it's interesting as we look at all of the dilemma that's occurring today in Detroit. And we think back to 1978. And where was Lee Iacocca in 1978? 1978 Lee Iacocca was the president and CEO of Ford Motor Company. In 1978 Ford Motor Company had a two-billion-dollar profit and they fired Lee Iacocca. Maybe we need more guys like Lee Iacocca.

I have a homework assignment for you, quickly. I know you don't usually get homework assignments at GAAS, but I have one. And it's this: I ask that each of you go back to your companies and organizations and make sure that everyone at every level within that company/organization is ready to assist shop owners and technicians preparing for the future. It's in our best interest that we have to be the messengers to make sure that the motoring public of this country understands that the automotive aftermarket has been and will be the best choice for automotive service and repair.

I thank you very much for your time this morning. Enjoy the rest of the conference.

(CONCLUSION OF SESSION)

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