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OFFICE OF ANALYSIS, RESEARCH, AND TECHNOLOGY

Costs and Benefits of Onboard Safety Systems July 16, 2008

Webinar Transcript

Presenters

- Amy Houser, General Engineer, FMCSA Office of Analysis, Research and Technology (ART)
- Dan Murray, Vice President, American Transportation Research Institute
- Andrew Boyle, Chief Financial Officer, Boyle Transportation
- Bryan Cook, Senior Technical Advisor, FedEx Freight

Speakers (optional)

- Kirse Kelly, Webinar Conference Host, FMCSA ART

Description:

FMCSA's Technology Division and the American Transportation Research Institute will co-host the fourth in their series of webinars that provide peer-to-peer industry insights on the impacts and opportunities associated with onboard safety systems. This webinar will focus on the determination of costs and benefits of onboard safety systems for motor carriers who purchase and deploy them. Insurance implications will be highlighted in the discussion with participating motor carriers.

PRESENTATION—PREVIEW OF COSTS AND BENEFITS OF ONBOARD SAFETY SYSTEMS

PRESENTATION TITLE SLIDE: PREVIEW OF COSTS AND BENEFITS OF ONBOARD SAFETY SYSTEMS

Operator:

Welcome and thank you for standing by. At this time, all participants will be able to listen-only until the question and answer session of today's conference. At that time, if you'd like to ask a question, do can do so by pressing * 1. Today's conference is being recorded, if anyone has any objections, you may disconnect at this time. Now I will turn the meeting over to the web conference coordinator, Ms. Kirse Kelly. Ma'am, you may begin.

Kirse Kelly (Webinar Conference Host, FMCSA ART):

Thank you. Thank you, Annie, and thanks to all who are participating in our webinar on the Costs and Benefits of Onboard Safety Systems. As Annie mentioned, time permitting all questions will be answered at the end of the call. You can also submit questions in this **Q&A Box** on the left side of your screen. You can ask those throughout the webinar, but they'll all be answered at the end of the call rather than during. At the end you'll be able to submit those questions online or ask them over the phone.

Please note, you will be given the opportunity to receive a copy of the presentation at the end of the webinar. A lot of people ask this is their favorite question. You will be given that opportunity.

I am also asked to say that members of the trade or local media participating in today's call are asked to contact our Office of Communications at 202-366-9999 at the conclusion of the webinar if you have any questions.

Now let me go ahead and turn you over to Amy Houser who is the Project Coordinator. She's a General Engineer with the FMCSA Office of Analysis, Research and Technology. Amy?

Amy Houser (General Engineer, FMCSA ART):

Thank you Kirse. Good afternoon everyone. It's my pleasure to welcome you to our fourth webinar in our series about Onboard Safety Systems. I would also like to thank everyone who answered the polling questions at the beginning of this webinar. So that you can be active participants where we can ask you questions in addition to you asking us questions, there will be some other questions throughout the webinar also for you to answer. I appreciate all of you who answered those.

Today we will be providing a preview of our benefit cost analyses of lane departure warning systems, roll stability control systems, and forward collision warning systems. As part of an ongoing effort that FMCSA has to encourage voluntary adoption of onboard safety systems,

these analyses they've built on previous field operational testing, but they're primarily focused on assessing benefits and costs for the end-users who are now responsible for investment and deployment of these systems. As a result, the objective of this work is to provide return on investment information primarily to our motor carrier industry in support of future purchasing decisions. Typically, you're probably used to the government doing benefit cost analyses that focus on societal costs and benefits. This is a little bit different in that it focuses primarily on the costs and benefits to the trucking industry.

I'm extremely pleased that through today's webinar not only will we provide a preview of our analysis; we'll have the opportunity to hear real-world insights from carriers about their practical experiences and benefits that they've encountered using onboard safety systems and other safety technology. Our industry presenters are Brian Cook who's a Senior Technical Adviser for FedEx Freight and Andrew Boyle who's the Executive Vice President and Chief Financial Officer of Boyle Transportation.

SLIDE 2: ASSESSING OSS: DATA ACQUISITION OBJECTIVES & SOURCES

First you're going to hear from Dan Murray from the American Transportation Research Institute, and he'll provide insight about the data collection that was critical in our benefit cost analyses. The American Transportation Research Institute, or ATRI—they worked extensively with FMCSA to conduct these analyses.

SLIDE 3: ATRI

They contacted numerous sources in the trucking industry that provided some of the most significant input for this work. Those are both the motor carriers who were early adopters of the technology, as well as insurance companies and legal firms who were intricately involved in financial aspects of crashes that are preventable by these systems. So, thanks to those folks, we were able to do this analysis. So Dan, I'm going to turn it over to you.

Dan Murray (Vice President, American Transportation Research Institute)

Thank you Amy and I will keep my comments short. As Amy indicated, the power of these assessments is the data is actual industry data that generates and derives from some facet of the industry, whether it's a supplier, a vendor, a carrier, an insurance company, a legal firm. I'm just going to walk through some of that sort of process, data collection process—preliminary collection and then validation throughout. It is essentially to give folks an understanding and an appreciation for the granularity of the data that was collected so that when you see and hear Amy's outcomes, you will understand that the applicability to the carriers is greatly enhanced in that regard.

SLIDE 4: RESEARCH ADVISORY COMMITTEE

ATRI, again, is a not-for-profit research arm of the industry working with the government and industry in bunch of areas: Research Advisory Committee, federal governments, state

government carriers, etc. That's an infomercial I'm not sure should be in this, so I guess I'll just keep going.

SLIDE 5: ONBOARD SAFETY SYSTEMS: RESPONSIBILITY-NEUTRAL SOLUTIONS

Onboard safety systems: one of the first things the industry knows is that these are extremely important tools that can be used because, among other things, they're responsibility neutral. They don't necessarily care if a car is cutting off a truck or what the underlying factors and circumstances are. They're taking action based on essentially electronic inputs. In that regard it's created substantial interest in the industry. In fact, when we do our two-year technology utilization research with GartnerG2 and others, onboard safety technologies are always at or near the top of that list of sort of emerging technologies that the industry is watching very closely. So we know that there's a high level of potential acceptance and utilization, and the question that FMCSA and ATRI are asking is "What will take the industry to those next steps?" These three technologies that we're focusing on address two of the most costly crash types, which are rear-ends and rollovers, and FMCSA Administrator Hill has made it very clear that while NHTSA does the mandating from the voluntary side of the adoption, FMCSA is very aggressively pursuing programs that will improve voluntary adoption. In that regard, all three of these technologies, as you saw from the survey, have great acceptance and promise.

What does industry require and need? Well again, based on research that's been conducted over the last several years, there's a continuum of requirements from industry ranging from financial incentives. In that regard there is a bill in Congress that's moving forward, albeit very slowly, that's looking at tax incentives for these systems. But all the way down in that continuum, based upon awareness levels knowledge, there is a substantial need for additional information and insights and data on how these systems work, where and when they work, and what's required to maintain and maximize them. Information becomes very important, as Amy has indicated. We've essentially discovered through research that government generated data, and peer-to-peer data sharing and information sharing are two of the most important credible sources for carriers. In fact, ROI is sort of a common denominator. Industry is highly competitive, 3.6 percent average operating margin, fuel pipe prices are skyrocketing. To fill an average classic truck, you're going to spend a thousand dollars, which is roughly the cost of one of these systems, so they need a relatively quick payback and a very clear and documentable ROI.

Where did we get our data and why and how? First of all, we started with this basic assumption that if a carrier is going to expend valuable financial resources on the purchase of a device, they need to know what their physical literal tangible ROI is.

SLIDE 6: DATA ACQUISITION OBJECTIVES

Anywhere along the way, who is cutting a check or receiving a check has been sort of an informal litmus test. They've done a number of studies where they've looked at full societal costs and benefits of these systems. Those are good studies from the societal standpoint, but like the rest of us if you go out and buy a Prius, you're not necessarily looking at total tons of noxious hydrocarbons reduced, as much as, how much gas money are you going to save. We approached it in the same way. We went to carriers, insurance companies, developed unit costs,

crash costs by type. A very robust data collection process developed and signed a number of very binding nondisclosure agreements, again by carriers, insurance companies, legal firms, cleanup companies, vendors and got into some good raw data that allows us to do the assessments.

SLIDE 7: CRASH COSTS

When we developed the initial formulas needed to fill in or populate the cost-benefit assessments, we started with six carriers—representative carriers—four insurance companies, two workers' comp companies, three environmental cleanup companies, and some legal firms; collected base data, started processing that and then, throughout the process, sort of had ad hoc committees within these industry sectors that we'd check in very regularly with.

SLIDE 8: OTHER DATA

As the model that we essentially developed—relatively easy to use model that allowed you to change the formulas and units—progressed, we'd go back and get validation with new and existing representatives of industry. Suffice it to say, some of the environments where these data and formulas are generated, for instance, the legal community, you are talking about settlement costs being dramatically different from court costs, from attorney's fees, from subject matter experts and all that is sort of populated across different components of this model. And again, Amy probably won't go into that level of granularity, but I'm trying to convey the concept that this was much more complex on the front end, but by the time this process was completed, we had a substantial amount of agreement on what the costs were.

Lastly, we were continuously going back, as Amy indicated, to some of the historical field tests. We had a regular and ongoing Telecons that FMCSA and ATRI hosted with various parties to the nondisclosure agreements to sort of validate our assumptions and our formulas. We worked with a CPA firm, again to develop an internal model that would allow us to plug numbers in and change them as needed. Then, a separate research initiative that we have underway with FMCSA, is the large sort of field test study that has a group of carriers that come together and provide tangible input on different issues related to onboard safety technologies, and in many ways their comments and input throughout this process has validated this assessment as well.

It looks to me, like the last slide Amy, is now this one. Let me just wrap up by saying, the data that has been collected is all readily available and transparent. The exceptions, of course, are the specific providers and in those instances where data sources are cleansed, we have continuously provided and described background information as in large national truck load, regional LTL, insurance providers, etc. So, if anyone at the end of this process has questions about the data inputs, certainly pose those as well. But again my interest was to convey that all of the data collected generates from some source. In many cases, that's the insurance industry, or the carrier, being the two primary beneficiaries, as well as the cost centers in these formulas.

I think that's it Amy. I'll turn it over to you for the meat and potatoes of the findings.

SLIDE 9: PREVIEW OF COSTS AND BENEFITS OF ONBOARD SAFETY SYSTEMS**Amy Houser:**

Okay, thanks, Dan. Before I get started here's just a question that I'd like to ask of everyone. I know some of the questions were specifically to motor carriers, but before I get started just give us your opinion on what type of crashes involving large trucks you're most worried about. Those could include rollovers, run off the road, head-on collisions, side collisions, rear-end collisions. There are, of course, other types of crashes, but the ones we're going to focus on are the ones listed above the other.

They just opened up the poll. It wasn't open originally. I'll wait a minute while you are thinking about that.

Dan Murray:

In our aggregated crash data from both the carriers and insurance companies in terms of total consequence and cost, rollover crashes are essentially number one and rear-end crashes are essentially number two, as I indicated, so it does appear that, relatively closely speaking, that the two crashes that the respondents right now are describing are those that are the most costly.

Amy Houser:

Right. And some of the crashes that tend to be very severe, again, we are going to be learning more about—at least we found the specific categories within these types of crashes and help prevent.

Okay. It looks like everyone is finished. Thanks for filling out that poll during this webinar. I'll get started.

SLIDE 10: ONBOARD SAFETY SYSTEMS

Essentially our benefit cost analyses, we focused on three specific onboard safety systems. We've involved in research for other systems, but these we had most of the data for and we also tested and evaluated them. Those are:

- Lane Departure Warning Systems,
- Roll Stability Control Systems, and
- Forward Collision Warning Systems

SLIDE 11: CRASH PROBABILITY

When we look at the costs and benefits of onboard safety systems, you'll see in the upcoming slides that the results focus on the probability of a truck being involved in different types of crashes that are preventable by the onboard safety systems and the financial costs of those different crashes to carriers. But I think this quote from the Insurance Institute for Highway Safety is important to always keep in mind. Many of the earlier adopters of the technologies,

they've actually followed this thinking and tell me that they deploy safety systems and promote other safety practices which are also extremely important because it's the right thing to do. They're thinking about this in terms of the tragic results of many of these crashes. [Quote from *Insurance Institute for Highway Safety Status Report*, Dec. 7, 2002, as seen on slide: "It's true that an individual's chance of crashing is small, especially on a given trip. But on a societal basis, crashes claim a huge toll in terms of deaths, injuries, and property damage."]

SLIDE 12: BENEFIT COST ANALYSIS

The benefit cost analyses that we did, we followed a specific methodology that I'm going to go through on the next two slides. First, we estimated the potential benefits of the technology by examining sets of crashes that we considered preventable by the different systems. We used crash data from the General Estimates System or GES to estimate the number of crashes over a five-year period from 2001 to 2005 so that the technology would prevent these specific crash types. Then, using that information from motor carriers and the field operational tests, we used efficacy rates that were used primarily to estimate the portion of those crash types that could be prevented by the technology, since we know that even if you look at all rollovers, for instance, in a curve, the technology won't prevent every single one. You'll often hear from the vendors, they'll say, well if that truck is going way too fast around that curve, then even the technology won't slow the truck down enough to prevent a rollover. And then there are other instances that could occur during these crashes.

Next, we estimated the costs incurred by carriers due to different types of crashes. We assumed the carrier would be self-insured and would bear all of these costs initially. Then we estimated the expected crash reductions resulting from the deployment based on the vehicle miles traveled per truck. In the analyses, they looked at a range of vehicle miles traveled but, as you can see in some of the later slides, there are lots of different results using different parameters. In some of the results, I am going to present—show what would be typical of a long-haul operation of 100,000 vehicle miles traveled per year.

SLIDE 13: BENEFIT COST ANALYSIS

Next, we estimated the cost of purchasing and deploying the technology over that five-year life. The technology may have a longer life, but we used as five years as the life of the technology. And then the net present value of that technology was computed. We discounted both the future benefits and costs and we used discount rates of three and seven percent. Essentially, what discounting does, it discounts the benefits and costs or those gains and losses that occur in different time periods so that they are in a common unit of measurement. We also calculated the payback periods to estimate the length of time to recover initial investments.

Now certain industry segments, they will experience different costs and benefits due to their different operational practices and due to the different insurance capabilities that they have. Those may fall outside of the range that we show in the cost estimates in step five, but, we did do a sensitivity analysis. Specifically, we emphasized some of the small carriers who aren't typically the self-insured carriers.

SLIDE 14: BENEFITS IN TERMS OF CRASH AVOIDANCE COSTS

As Dan said, he covered this; I just covered it in the previous slide. This is the data that we used. We used both crash data and mostly that gave us successive crashes that the technology addressed. We also used motor carrier and field operational test information. That gave us the ranges of efficacy or how effective these systems could potentially be in preventing these crashes. All the data that Dan talked about that we collected from the industry looking at the costs of different types of crashes.

SLIDE 15: LANE DEPARTURE WARNING SYSTEMS

For those of you who were not at the previous webinars, I'm going to do a very brief explanation of the technology itself, starting out with Lane Departure Warning Systems. These are forward-looking vision-based systems. They consist of a main unit and a small video camera that's mounted on the vehicle's windshield, and they record the data of the roadway ahead. These systems, they warn drivers of the lane departure, when a vehicle traveling above a certain speed threshold. Typically, for most of the systems currently in the market, that's 35 miles per hour. When the turn signal is not being used as if the driver makes a lane change, then the Lane Departure Warning System will notify the driver through, typically, an auditory alert that the truck is departing from the lane. These systems also notify drivers if the system malfunctions or the lane markings aren't adequate for detection. A reminder about this type of a system: it's a warning system, so it doesn't take any automatic action or control of the vehicle. Again, drivers, they are ultimately responsible for the safe operation of their vehicle and responding to that alert.

SLIDE 16: SINGLE VEHICLE ROADWAY DEPARTURE CRASHES PREVENTABLE BY LDWS

The numbers in this table and some of the upcoming tables, they reflect the average annual estimates of specific crash types, at both a low efficacy and high efficacy estimate of the technology in preventing different types of crashes. As you can see, Lane Departure Warning Systems can help to prevent several different types of crashes. This slide shows that one type of crash that lane departure warning systems can help to prevent are single vehicle roadway departure crashes, and they can result either in a potential rollover or a collision with a fixed object as the truck departs the road. I have presented this information previously where I've shown the total of these numbers. At this point, I'm showing those numbers multiplied by the different efficacy rates. As you look at these, you can look at the severity, and you can see, for instance, rollovers--if you combine the injury and fatality numbers and compare that to the property damage only crashes, you can see that over 50% of rollovers that are potentially preventable by Lane Departure Warning Systems are some of the more severe crashes since they result in injuries and fatalities.

SLIDE 17: SAME AND OPPOSITE DIRECTION LANE DEPARTURE SIDESWIPES PREVENTABLE BY LDWS

As we look—Lane Departure Warning Systems can also help to prevent some of those inadvertent lane departures as the truck goes over the lane line, and those typically result in the

sideswipe crashes. As you can see from these numbers, you can see that these types of crashes are typically less severe than other types of crashes such as rollovers, if you again compare the numbers of property damage only crashes, compared to the combined injury and fatality crashes.

SLIDE 18: OPPOSITE DIRECTION LANE DEPARTURE HEAD-ON CRASHES PREVENTABLE BY LDWS

The last potential crash type the Lane Departure Warning Systems can help prevent are those opposite direction lane departures which would result in head-on crashes. Again, the numbers of these are fairly small where the driver would inadvertently go over that lane line and it would result in a head-on crash, but you can see that these are very severe crashes.

SLIDE 19: ROLL STABILITY CONTROL SYSTEM (VIDEO)

Some of you may have seen the video clip of Roll Stability Control Systems. Next we are going to show this clip.

Currently, the Roll Stability Control Systems, what they do, they monitor the lateral forces while the vehicle's in operation and as it goes around the curve. We are going to just see—this is from one of the system suppliers. This is at the test track of the vehicle, and when the electronic control unit within the Roll Stability Control System processes information from various sensors that detect a risk of rollover, then the system automatically reduces the throttle, applies engine and foundation brakes to counteract the tendency of the vehicle to rollover. This is again due to excessive speed in a curve, is what you are looking at right now. You can see the vehicle on the top of this film clip does not have a Roll Stability Control System and you can see the wheels starting to lift off (the road). On the bottom, it shows with a Roll Stability Control System, and it slows the vehicle down so that, again, the tires don't come off the road and cause a potential rollover.

Okay, I'm going to go on to the next slide.

SLIDE 20: ROLLOVERS DUE TO EXCESSIVE SPEED IN A CURVE PREVENTABLE BY RSC

The biggest set of crashes that Roll Stability Control Systems helped to prevent are rollovers due to excessive speed in a curve. They can also help to prevent some of those avoidance maneuvers. This was the biggest step that we looked at. Again, we used two efficacy rates, a higher rate and then a lower rate. You can again see that rollovers, whether or not it's due to roadway departure or from a rollover just due to excessive speed in a curve, that again, those are very severe crashes.

SLIDE 21: COLLISION WARNING SYSTEMS

Next system up is the Collision Warning System. This slide shows the new interface for one manufactured system. Previously we showed in other webinars and other presentations that I've

done the older system that's on the market. This system provides a progressive series of lights and auditory alerts as the truck is within a certain following interval and it ranges from three seconds to half a second from the vehicle in front of a truck.

SLIDE 22: ADAPTIVE CRUISE CONTROL

These systems, they can be integrated with adaptive cruise control which helps to maintain a specific following interval between the truck and vehicle in front of it. It does so by decelerating the vehicle or truck that it's in. If a vehicle's outside the range of the adaptive cruise control, it operates as normal cruise control does.

SLIDE 23: REAR-END CRASHES PREVENTABLE BY FCWS

If we look at the crashes that are preventable by Forward Collision Warning Systems, those are the rear-end crashes. Here again we show a high and low efficacy rate. What's important to remember about the rear-end crashes is the fact that they typically involve multiple vehicles. Rollovers, primarily, looking at the data, they typically involve one vehicle, the truck itself; occasionally another vehicle will be involved. Sideswipes typically involve a truck and one other vehicle. A lot of the rear-end crashes involve two, three, or more vehicles. In this case, if you look at this picture, this is actually from the Large Truck Crash Causation Study, as were the other pictures. This actually involved four vehicles and involved more than one truck. Fortunately there were no fatalities in that particular rear-end crash, but again, a severe crash in many instances.

SLIDE 24: IS IT WORTH THE INDIVIDUAL RISK?

Now we're going to look at the analysis of the cost and benefits of deploying a Forward Collision Warning System. I'll use that as the example as I run through our methodology just due to time. Again, as you look at the financial costs, it's still important to keep in mind the ultimate importance of preventing fatalities and injuries that can be accomplished not only through technology adoption, but through an overall culture of safety.

SLIDE 25: TYPICAL REAR-END CRASH COSTS

These are costs for typical rear-end costs. Actually, the cost here is the labor, and workers' compensation applies if there's a driver that's hurt or killed in a crash, so these are actually true for all of the different crash types. The driver replacement costs, they related to training, testing, hiring, and orientation activities when a new driver is brought on to the organization if the driver in a crash is killed or severely injured. The median workers' compensation claim for \$62,728 for motor vehicle crashes was determined from insurance company data and again we did assume that the carrier was self-insured in that case. Then to accurately account for the actual labor costs associated with truck crashes, as well as the cost savings, these labor costs are multiplied by the average number of injuries and fatalities that were incurred by the truck drivers on a per crash basis. We multiplied those two numbers above by 10 percent, and that's the average number of

truck drivers that are injured per a rear-end crash. About 40% of truck drivers are killed in the fatal crashes, so we used those. Those would differ among the different crash types.

SLIDE 26: TYPICAL REAR-END CRASH COSTS

Operational costs were also considered in this analysis. They included cargo damage, delivery delays, loading and unloading as well as towing, inventory, storage, and other miscellaneous costs. These are specific for the rear-end crashes, but as you know these costs can vary substantially especially due to the different types of cargo that are being carried by the truck.

The cargo delivery costs, they included any penalties or reimbursements that a carrier pays as a result of a late delivery. The cargo loading and unloading costs are direct costs of the company for moving cargo from the crash scene. Towing costs include the tractor and trailer being towed. In addition, there's often inventory or cargo storage costs. The miscellaneous costs include things such as calling the customer after a crash or any type of public relations costs.

Typical out of pocket costs for environmental cleanup, again, that depends on the crash and whether or not there was any type of cargo spillage that would require environmental cleanup. For the rear-end crashes, the interviewed carriers estimated a median cost of \$14,000 per crash, and that included the fees that are paid for the environmental cleanup company. The median cost for property damage and surrounding infrastructure damage; that refers to a crash where there is damage to structures other than the truck, such as damage to the environment that could be, for instance, the guardrail, or other types of damage and also damage to the other vehicles.

SLIDE 27: TYPICAL REAR-END CRASH COSTS

One of the big costs is the legal costs of crashes. Legal costs relate to court costs, attorney fees, and out of pocket settlements. They vary depending on the negligence and the type of severity of the crash. The legal fees cost category included the crash reconstruction costs, expert witnesses, and fees paid to attorneys. The court costs included legal filing fees, court reporter fees, and other miscellaneous costs related to filing and completing litigation. The out-of-pocket settlement costs are expenses that are paid to claimants. Again, you can see what those costs were determined to be for the rear-end crashes. Again, we specifically looked at what the average annual number of injuries per injury crash because those costs relate to rear-end crashes. Again, if there's an injury crash, there typically will be more than one person injured. Then we also looked at the injuries per fatal crash because a fatal crash can not only include one fatality, but also injuries, and they have costs associated with them. Then we also looked at the annual number of fatalities per fatal crash, and we used those numbers to get our results.

SLIDE 28: TYPICAL REAR-END CRASH COSTS

This table is a summary of a typical rear-end crash and the costs that could be avoided potentially through the use of a Forward Collision Warning System. These avoided costs are the benefits of the technology deployment. So again you can look; often we hear what's a typical cost of a fatal crash, a rear-end crash and these are the costs that the motor carrier would incur.

SLIDE 29: MORE NUMBERS...

Got some more numbers for you; throwing a lot of information at you.

SLIDE 30: FCWS TYPICAL COSTS

The next part of the analysis was estimating the cost of the technology and its deployment for the Forward Collision Warning System. We estimated the price to about \$2,000. We assumed minimal maintenance over normal vehicle operating expenses over those five years; that does not mean there isn't any. Sometimes, from the other webinars the carriers did talk about some instances and it was mainly due to potentially replacing some of the parts of the technology. We did look at two different conditions. They included both the technology being financed and not financed. We also looked at federal tax savings due to depreciation. Some of these technologies are retrofitted. You don't receive that benefit, but any technology that was installed by the OEM, where the technology is considered part of the truck cab when it's purchased, then that cost can be depreciated. We also included annual driver training, and this is about an hour per year for training for use of this particular system.

SLIDE 31: ANSWERS ...

Here are some specific examples of some results. Keep in mind that we did several different options. We looked at several different VMTs, financing versus not financing, different discount rates, different technology efficacy rates. This is just a snapshot of a few of the results.

SLIDE 32: FCWS BENEFITS VERSUS COSTS EXAMPLE

If we look at the Forward Collision Warning System after it went through all the data input, using the assumptions that I provided earlier, what this came out to be was these systems were cost beneficial, particularly for those self-insured carriers. For every dollar spent on the technology, the return would be about a dollar, or \$0.98, or about \$2—this is that the lower efficacy rate—and the payback period would be 26 months. That's just one of the results of many for Forward Collision Warning Systems.

SLIDE 33: RSC BENEFITS VERSUS COSTS EXAMPLE

As we look through at Roll Stability Control Systems, again we use different input data than the rear-end crashes, but this is just a snapshot of one of the results from that analyses. This system shows for about every dollar spent—and this technology cost was about \$1,000—we estimated the return is a little bit over \$2 at the lower efficacy rate and a payback period of about two years.

SLIDE 34: LDWS BENEFITS VERSUS COSTS EXAMPLE

The Lane Departure Warning System: we estimated a technology cost of a \$1,000 and the return on investment, as you look at the particular assumptions I have up here, would be again close to that \$2 mark; a \$1.93 for every dollar spent. The payback period would be 29 months.

SLIDE 35: INSURANCE IMPLICATIONS

In addition to the self-insured assumption in our analysis, we also analyzed the benefits and costs of these technologies by carriers who have insurance deductibles. We looked at both \$50,000 which is a typical deductible for some of the larger or medium-sized carriers, but we also looked at a deductible of \$5,000 per truck. We have again different numbers based on different assumptions, but it did show, for those low deductibles, that a carrier may not achieve a break-even point. In other words, you may not get a dollar back for every dollar invested for the technology. But carriers do have to consider that if they are in a crash or the severity of those crashes increase that they are in, that the insurance premium cost will increase, typically, until the carrier's insurance costs equal or exceed the investment cost of the technology potentially, or there's always the danger that the carrier could be dropped altogether by an insurance provider. So again, this technology, in a way, is a type of insurance against some of these crashes.

SLIDE 36: QUANTIFIABLE CRASH COSTS ARE THE "TIP OF THE ICEBERG"

In addition, there are other considerations other than the cost that I just discussed. Those costs I just discussed in great detail about the Forward Collision Warning System, those were costs we could reasonably quantify from the information that we collected, but they are just the tip of the iceberg. The major considerations with these technologies, as with other technologies or practices to prevent crashes, are the indirect costs of crashes.

SLIDE 37: INDIRECT COSTS OF CRASHES

Those indirect costs are very important to many carriers. We surveyed about 56 motor carriers a while back. We gave them a list of 21 different costs. Within the top 12 significant costs were some of the indirect costs that include rises in insurance, included impacts to Federal safety ratings, loss of good will, public image impacts and employee morale effects. I hear all the time from many carriers when I asked them why they are deploying this technology, a lot of them actually give me these types of reasons for the deployment.

SLIDE 38: NEXT UP . . .

In conclusion, this was just a preview of some of the cost and benefit analyses we've conducted for the three systems. Feel free to contact me if you have any questions. Also, Dan Murray, I don't have his information up on this particular slide, but you can contact either one of us.

Kirse said that contact information will be provided at the end. Feel free to contact either one of us with any questions or requests for any further information.

Now in response to these findings our carrier representatives will be providing information about their experiences, about what technology they are using, as well as the benefits of these technologies and what they envision on the horizon relative to safety technology. First again, here is the question for you to answer, after you heard my presentation, maybe you changed your mind about the types of crashes that you are most worried about.

SLIDE 39: ONBOARD SAFETY SYSTEMS

Next up we have Andrew Boyle. Andrew is the Executive Vice President, Chief Financial Officer of Boyle Transportation, which is a motor carrier specializing in cargo's extensive safety and security. Prior to returning to the company in 2003, Andrew was an investment banker with J.P. Morgan. He's also the chairman of the Massachusetts Motor Transportation Association. He's also a member of the Executive Committee and Board of Directors of The American Trucking Association.

Andrew Boyle (Chief Financial Officer, Boyle Transportation):

Hi, Amy and thank you. We are very happy to participate again. I would just like to commend FMCSA and ATRI for the efforts just over the past year. To think where we were a year ago in trying to answer many of these questions that motor carriers posed as to how to justify or evaluate the cost and benefit of many of these systems—much has been done since then. I think that's a huge benefit to the industry. I would also like to further elaborate on the value of ATRI for those of you who are not that familiar with it as the research arm of the industry in working with government agencies. As individual carriers, we often have difficulty assessing the efficacy of technologies or practices such as the ones that we're looking at today, and the fact that ATRI obtains information from a broad range of actual industry users and then synthesizes that information for us to apply to making these decisions as to whether buy them, is hugely valuable from where we sit. So, for what it's worth, I would encourage everybody to participate in ATRI surveys when they come across your desk or your computer.

SLIDE 40: OUR APPROACH TO SAFETY TECHNOLOGY

Just a little bit on the presentation about what our experience has been with Onboard Safety Systems. We began in 2000, really, to use Forward-Looking Collision Avoidance Systems and related Eaton Vorad products.

In general, our approach to safety technology has been, first and foremost to mitigate the risk of an accident, as Amy discussed earlier, particularly before we had the information that's available now on an industry-wide level. It's really just making the leap and saying, it's our responsibility to try to mitigate risk as much as possible. We're never going to get to an absolute zero chance of catastrophic accidents, but we want to get that probability as close to zero as possible.

Next, the way we try to approach this is to provide the professional drivers the tools to do their jobs as safely as possible. I'll touch on that a little bit again later.

It is a selling point. It's a selling point in recruiting. It's a selling point in sales to customers and potential customers and then to other interested parties such as insurance companies, if nice folks at banks let us buy trucks. Up to this point certainly, we've just kind of been doing a kind of just the "back of the envelope" cost analysis to determine the value. We, as a carrier, have been focused primarily in the efficacy of a technology. In other words, does this thing work, first and foremost, and then if it can work for the driver and help the driver do their job more safely, then we can justify it in the fact that that driver individually will be able to make better decisions over the road.

SLIDE 41: SAFETY TECHNOLOGIES WE EMPLOY

These are the systems that we currently employ in our fleet. We have—as many carriers do, we have for many years employed automated transmissions, and I must add here, because we considered it a safety technology simply because the driver can have two hands on the wheel, and it just limits the number of functions that they have to perform in the truck.

Next, as I mentioned, since 2000 we've been using the Eaton Vorad system along with the Side Sensor, so it has the Front Forward Looking Radar as well as the Side Radar. It's integrated with SmartCruise in the Freightliner application.

Next, Roll Stability Control: we have in 100% of our tractor fleet, and I'd say about 35 percent of our trailer fleet currently.

We have, in all of our over the road tractors, the SideTracker Video Camera which is mounted on the front right fender with the little five or six-inch monitor mounted on the dash. We've got about 75 percent of our tractor fleet outfitted with Lane Departure Warning.

Our application is primarily an over-the-road one, so an average length of haul is about 900 miles. We have team drivers in all of our trucks, and we have limited ability to see our trucks at terminals. In terms of the safety culture that Amy encouraged, sometimes in a pick-up and delivery local type of setup, you can employ the safety culture really by doing yard checks more frequently before someone pulls out to check their safety belt and other checklists. However, in the over-the-road environment, a large component of the safety culture is to outfit equipment with the specifications that are safest over the road.

SLIDE 42: PROFESSIONAL DRIVER SURVEY AUTOMATED TRANSMISSION

About three years ago we conducted—no, sorry two years ago—we conducted a survey among a group of our professional drivers, about 70 of them, and asked them to evaluate and fill out this survey for safety technologies. The first here is for the automated transmission. As you can probably guess, we have an overwhelmingly positive response on those. The questions we asked are:

- Is this a valuable tool to you over-the-road?

- Does it reduce fatigue?
- Lastly, does it help make you a safer driver?

The 86 and 88 percent response to the first two questions are very favorable. You might say that the third question, the element of pride, might get in the way and somebody might say, “Nothing can necessarily make me a safer driver,” but, regardless, we have had a majority of respondents in the affirmative there.

SLIDE 43: COLLISION WARNING SYSTEM

Next is the Collision Warning System, and we list them here, all three components: the Collision Warning System for Forward Looking Radar first, next the SmartCruise, and lastly the Side Sensor. In all cases, we had very favorable response here. That might be due to the fact that we already had it in our fleet for about six years at this point, when this survey was conducted.

SLIDE 44: TRACTOR ROLL STABILITY ADVISOR & CONTROL

On Roll Stability: this is for the tractor only. That’s how we framed the questions. Even though we actually had fairly positive responses in terms of, “It can prevent accidents,” this is probably the least tangible safety technology to the professional driver, because if someone’s doing their job properly they really should not even know that it’s there. If it has prevented someone from rolling over, that means they are probably taking an exit ramp too quickly. We do not use bulk fuel tankers or bulk tankers, so maybe it’s a lower probability in general, but some people would not necessarily admit to it either, because that means, again, that they weren’t doing their job—they weren’t driving appropriately. Even though this doesn’t have as high marks as some of the other safety technologies, I think the fact that it’s there, it would enable people to prevent an accident was still a very strong response.

SLIDE 45: PASSENGER SIDE VIDEO CAMERA WITH DASH-MOUNTED MONITOR

The Side Video Camera: the brand name of the product we use is the Side Tracker. A couple other fleets had referred it to us. Probably, it is the most tangible of all the safety technologies because, again, it’s simply a video camera with a dash mounted monitor. It looks across about four or five lanes wide on the right-hand side, so it’s really a visibility tool for the professional driver. Some of the feedback on this product is predictably, at night when oncoming headlights kind of flash and glare on the monitor—that’s when it’s least useful to drivers, so a lot of them like to turn it off at nighttime. Certainly, it’s a great tool for blindside backing and parking, and pulling out of tight locations.

SLIDE 46: MOVING FORWARD

Moving forward, we generally take the approach that these products should be installed at the factory. In years past, we had difficulty when one supplier said that the additional add-on product

was not covered by the warranty or voided any sort of warranty of the OEM. We really wanted to get away from that. And hopefully more of these products become integrated at the factory.

As many of you know the devices now have behavior monitoring capabilities, so the safety director or other person remotely in an office can monitor hard braking incidents, speeding or other behaviors that they want to reduce. We currently do not use those capabilities, but we are looking at using them going forward.

Of course, the lucrative wireless utility business is drawing many of these safety technology vendors into it. That's a very crowded space, as we all know, given the success of a handful of suppliers, and a lot of people are trying to get into that business. It's a little bit redundant for many different providers trying to sell you the same type of questionable benefit for high costs.

Lastly, the way we really try to sell these technologies to the professional drivers that we recruit and bring aboard, is that these are tools. It's never going to prevent us from trying to hire and qualify the safest drivers, but we're just simply trying to give them the tools to do their job as safely as possible. Another way we try to sell it is we feel an obligation to them, to the motoring public, and to the customers and to the families of the drivers to give them those tools.

Amy, that is about it for me.

Amy Houser:

Thank you, Andrew. It's always a good to hear what drivers think about these technologies because they are the ones that are really using these. We have a couple more questions here.

Guest: *Rank these onboard technologies in order of what would be your preference, whether or not you'd have them—in this case it is not just the motor carriers but on your car or truck.*

Andrew: Amy, I did not have—unfortunately, we conducted that survey prior to the deployment of the Lane Departure Warning Technology. We will conduct another survey here in the next few months and we'd be happy to share the results. The anecdotal information has been quite positive.

Amy Houser: Oh good, that's good to hear. I feel like every time I listen to different carriers, I learn more about their experiences with these systems—I learn more about systems' capability—so it is a very valuable to hear from you all.

SLIDE 47: BRYAN COOK, FEDEX FREIGHT

Amy Houser:

Our next speaker is Bryan Cook. He is a Senior Technical Advisor at FedEx Freight in Harrison, Arkansas. FedEx Freight is a leading U.S. provider of regional, next-day, second-day, and inter-regional bus and truckload freight services. Bryan advises FedEx on new technology directions, as well as hardware and software solution architecture and design. His experience in all forms of

Wireless Data Transport Architectures, coupled with his experience in the less than truckload industry, provide him with a broad understanding of methods for collecting relevant data, applying data to business rules, and methods for transporting data in a cost-efficient manner. We are very happy to have Bryan here to talk about FedEx's experience using safety technology.

Bryan Cook (Senior Technical Advisor, FedEx Freight):

Thank you. I'd like to also thank FMCSA and ATRI for collecting this data and kind of going through the process of sorting it out where it makes better sense to some of us that don't like to crunch numbers. Basically, from a FedEx Freight standpoint, there are two benefits that we see from Onboard Safety Systems. The first, of course, is safety, the safety of our drivers; their work environment, which is the tractor—we'd like to provide them with the safest work environment that we can possibly provide—and also just the safety of the public in general. Just looking at some of these numbers, I'm almost scared to get in my car and drive down the road. But I think with the three systems that we've talked about today, the Forward Collision Warning Systems, Lane Departure, and Roll Stability Systems, those three systems implemented into our fleets have provided that safe working environment, as well as some of the data that affects our operations, and does provide an operational benefit.

I look at the features of these technologies more than how they have reacted in the past, but some of the adoption criteria—the way that we look at them to adopt. I'd have to agree with Andrew on most points that he said as far as mitigating risk and does the technology actually work. And then, how can we use the data that the technology provides to one, educate our drivers for better, safer driving practices, but also provide benefits to the operation. Things like fuel consumption or vehicle maintenance, which are both expensive, can be assisted by these technologies in providing data that leads to the driver behavior or to different components of the operation that might assist us in reducing overall operational costs.

One of the things that we looked at when we were looking at some of these different technologies was that the data that's coming from those technologies could be used for an operational benefit if we could get the data put together in a way that we could sort through it and basically understand how our tractors were operating in the field, both over the road and in a pick-up and delivery operation. As far as the safety environment, the education of the drivers and the adoption of these technologies, we've had a very positive experience from our drivers as far as technology adoption and use. Most of these technologies take very little to no education. The Stability Control System, if you're not operating the vehicle outside of its parameters, you're not even going to know it's there, so there is almost no education other than the fact we notify the driver that there is a system there. The Forward Collision Warning System and Lane Departure Systems do a couple of things for the drivers. They reduce fatigue for the driver over the road and also the collision prevention or Forward Collision Warning Systems really kind of give the driver a "in real-time" behavior modification, if you will. I don't want to say it's a modification of his behavior, but it gives him an alert that says that hey, you may be driving a little bit close and then, in effect, does change the behavior of the driver.

I did see a question on there that somebody asked: *Does anyone feel it would reduce the driver's attention on the road?* I really would disagree with that from our drivers' standpoint. Most of the drivers are very proud of the fact that we do put a lot of these safety systems on our trucks.

We're looking at new technologies and those types of things. I think it has made them pay more attention to the safety aspects in kind of building that environment of safety and understanding and education towards safety.

As far as the future of the technology goes, we are constantly looking at new and better ways of providing our drivers with a safe working environment. The three systems that we have talked about here are just really one small piece of a combined safety system. In the future, we see those systems working together, very similar to the way the Forward Collision Warning System and the Adaptive Cruise Control work together. All of these systems, as they start becoming more integrated and working together better, will create a safer environment for those vehicles. Hopefully, we can get the vendors to talk to each other, and then they can provide some of that data back to us, because I think as a carrier, it is very important that we be able to access that data in a way where we can use it both for safety and for operational benefits.

That's all I really have.

Amy Houser:

Thanks a lot Bryan. I think it's great to hear from FedEx because we all have—we all deal with FedEx all the time in our daily lives, so it's great to hear from you.

Next, our participants, now you have an opportunity to ask questions. I believe some people are already starting to type in questions, which is great, as we were doing our presentation. Kirse Kelly is going to provide some additional information, if you haven't figured out the system yet, in addition to she's going to help read the questions while Dan and I will try to work on who maybe should be the best person to answer them. If you do have a specific question to a specific speaker, it really helps us out a lot to say, for instance, "I'd like to talk to/ask this question of Brian and Andrew." Because it's a specific carrier question, you want to hear their insight versus a government answer. Or if you want to hear an answer from ATRI or myself, feel free to do so.

[1:03:22]

QUESTIONS AND ANSWERS

Kirse: Okay, I just want to first give you some information on how to ask questions. As I said in the beginning, you can submit them in the **Q&A box** which is at the left side of your screen, or if you want to ask questions over the phone, you just press *1 and state your name to the recorded message. When your line is open, our phone operator will announce you by name, so please state your name clearly for proper pronunciation. Questions are going to be answered in the order that they are received. Please note that you will be given the opportunity to receive a copy of the presentation at the end of the webinar. Actually, I'll put it up in just a few minutes so that you can download it now if you have to leave early.

Frank

Molodecki: *How effective is Roll Stability on the tractor and not the trailer?*

Amy Houser: In our field test, we tested the Roll Stability Control System, it was actually on the tractor. From what I hear from some of the manufacturers—and actually, I said they can pipe in if they want—from what I hear, there are advantages to using the system on the tractor. It also slows the vehicle down. It uses the brakes on both the tractor and trailer as the truck goes around the curve. Andrew, are you using both?

Andrew Boyle: We have it in a hundred percent of our tractors and maybe 35 percent of trailers. I think the simplest reason to explain that this varies is that if our trade cycle in tractors is every three or four years, it was much easier to integrate them when we first made the decision four or five years ago. In trailers that you keep for ten or fifteen years, it's more challenging. Plus, the anti-lock braking system that the Roll Stability Control sits on top of on the trailer, you need a more modern standard that's used. You can retrofit certain trailers with it, provided that they have their proper more recent ABS system. Ultimately, we will apply them to all. I know there are probably some phone callers—the National Private Truck Council, I know, has been moving forward with that and I think that whole segment of the industry is very anxious to apply that technology because, by definition, with the high center of gravity vehicles they tend to be more prone to rollovers. I know they're very active in evaluating that.

William Williford: *How do the systems reduce fatigue?*

Bryan Cook: Basically, all of these systems in conjunction with each other provide the driver with a number of tools that he didn't have in the past. I can say from personal experience driving tractors and trailers that before these systems came into play, it was more fatiguing to me trying to pay attention to all of the different components: standard transmission, is there somebody—am I driving too close to somebody, am I weaving in lanes, those type of things. All of these tools together kind of provide that awareness to the driver that he didn't have before, and I think those things in conjunction do reduce fatigue for the driver. That's not going to reduce fatigue for a driver who's been on the road for 20 hours. It's not going to help him from falling asleep, but it will give him some tools that will assist him in the process of driving a tractor.

Kirse Kelly: Operator, do we have any questions on the phone line at this time?

Operator: At this time, there are no questions.

Kirse Kelly: Okay. Moving to the next written question:

Paul Abelson: *Does FMCSA look at vocational trucking too? There are utilities, construction, and concrete trucks, waste collection and a host of other vocations that can also benefit from OBSS.*

Amy Houser: We are definitely aware of the different types of trucks. In our field operational tests, they were primarily focused on tractor-trailers for Roll Stability Control, and we actually had a cargo tanker. Cargo tankers were the truck configurations used there. We do know from our Large Truck Crash Causation Study, actually I read through, I think, about all of the rollovers in that study. It was interesting that very few of the straight trucks were actually involved in rollovers that could potentially be prevented by Roll Stability Control Systems—which means that I looked at the trucks primarily going too fast around a curve and rolling over—but there were a couple concrete mixers that did rollover in those situations. I do know that the system suppliers do have technology control that do address the concrete mixers. In fact, they do a great demo where I've actually written in the concrete mixer. We are aware of the different truck configurations. That's just one example of one of the vocational-type trucks that I am aware of just through our crash data. The testing is primarily done on tractor-trailers to date.

Mike Harrold: *How do you handle a trucking company's resistance to using this technology?*

Amy Houser: I guess that's for FMCSA. One of the things we have been trying to do and I've been working with carriers, as well as—Bryan and Andrew know that they've been on groups; we've had expert panels where we've worked with different carriers trying to get advice and information from them related to ways we can encourage deployment of these systems. Right now, ATRI is also working with FMCSA. Looking at the demographics of the industry and looking at ways we can address some of the carriers that may—wouldn't necessarily be resistant, but maybe don't know about the technology or need further information in order for them to make a purchasing decision. We are doing that through that study which Dan Murray is working on with me. I don't know, Dan if you have anything else to say about that.

Dan Murray: No, I think you covered it well. We certainly have discovered through this process that the operational and financial environments are dramatically different for small, medium, and large carriers. Amy was pointing out something. We use the term "self-insured" for medium and large carriers, but that doesn't mean they necessarily have self-insurance filings, as much as the deductibles essentially exceeded the value of the crashes. Carriers that had \$50,000 deductibles to \$150,000 in many cases had insurance but were covering the full costs, *aka* writing that check. That was the self-insurance definition we used, but now we've discovered small carriers are using the deductibles for one or two or sometimes three crashes that again, as Amy indicated, the premiums ultimately catch up to those carriers. So how can we move them off the deductibles on to the Onboard Safety Technologies?

Guest: *How has the insurance industry been involved in supporting the use of these devices?*

Amy Houser: I'll answer it, and then I can hand it over to Bryan and Andrew who might have other insights into this. Again, I think the insurance companies have been very interested in our research. They have actually provided a lot of data to us for the analyses such as those that ATRI and FMCSA just conducted. I see them as being very interested in what we're doing. They have actually been partners with us in these types of studies. From what I hear, they actually look at the crash history in determining the rates and the premiums and those kinds of things for the trucking company. Andrew and Bryan may have had an experience where they . . .

Andrew Boyle: Sure, this is Andrew. Ultimately, you're correct that all underwriters will tell you that they judge their pricing on the basis of loss experience and projected losses. If this is one part of your overall safety program, then they will certainly endorse it and encourage you to purchase and deploy the best technologies. However, there is not a direct benefit that you could say, like with your homeowners insurance, "Hey, I have a home alarm or smoke alarms," well here's your direct refund or reduction. That's not the case. However, I think it's valuable there. They are certainly partners with you, and if it helps reduce your risk profile that they are certainly in favor of it.

Tom Anderson: *We can see the benefits of having this technology. Is there a vendor that is going to create one unit that will cover all of these technologies?*

Amy Houser: I do know that vendors are very active in the integrated systems. We're currently involved in a test with an integration of Forward Collision Warning, Side Collision Warning and the Lane Departure Warning. Actually, two manufacturers are working on that system that we are involved in the testing of. and we call it the Integrated Vehicle Based Safety System. That's a case where they are working on an integrated system.

Other systems suppliers, the Stability Control Systems Suppliers, the next system that we're very excited about is the Collision Mitigation System where it builds upon the electronic stability control (which wasn't the focus of one of these analyses). We look at that as a future analysis that we are going to do. They help to prevent rollover crashes similar to the Roll Stability Control, but also help to prevent some of the loss of control crashes. They're going to build on that system and develop—it's going to be on the market—a system that involves collision mitigation which includes Electronic Stability Control in addition to the Forward Collision Warning and Adaptive Cruise Control. So that definitely is the trend with the vendors.

Kirse Kelly: Are there any questions over the phone at this time?

Operator: Once again, if you'd like to ask a question please press *1. One moment please.

Kirse Kelly: Okay, the next written question we have is:

IMMI: *What is the discount rate mentioned by Amy on slide five?*

Amy Houser: The discount rate, if you look, it's on—I mentioned a three percent and a seven percent discount rate. What that means is when we do an economic analysis, for instance, we'll have some values when you purchase a technology that's a present cost, but then each year there involves costs, for instance, for the training of the drivers or there might be a future cost. What you try to do is bring all these costs back to what's the present worth of those costs and those benefits. That way you can compare those so that you have a common time where you compare those two estimates. That's essentially what it does. We use two different rates. I believe Dan said one carrier used seven percent. We actually got these from the Office of Management and Budget. They're typically used in economic analyses by the Government, but they are also within the ranges of what carriers also see.

Dan, do you have anything else on that?

Dan Murray: No. Essentially, one is a conservative figure and one is liberal figure. We tested these using both carrier accountants and a CPA firm. Within the three to seven percent, the majority of carriers were identified in there somewhere, so the range is extremely representative. The model I discussed earlier that Amy and I have used, allows you to play with either the figures or change them hypothetically.

Mike Harrold: *How easy is it to download the data for the purposes of driver behavior modification—i.e., can you get a CADEC system to record events for downloading?*

Amy Houser: Bryan or Andrew, do you do any onboard monitoring with these systems right now?

Andrew Boyle: I think Bryan said he did.

Bryan Cook: One of the difficulties in these systems today is the fact that to try to download the information, for an accident reconstruction or driver behavior modification is extremely difficult. Hopefully that will change in the future, but today the vendors that are producing these systems have very proprietary software. Besides the proprietary nature of the software, which makes it very difficult to download, it's also difficult to tie the data to a specific driver. If you had a team for instance that was driving and neither of those, as a result of an accident, could respond to your questions, if you were to download the data you may not be able to tie that data directly to either one of those two drivers, and that makes it very difficult for us. There are systems today, we've seen on the market, that will allow you to have both tie the data back to a driver and to more easily download the data, but again, it's proprietary in nature and it's very difficult to correlate data from different systems.

Paul Sauve: *Does anyone else feel that these technologies will make drivers less vigilant?*

Amy Houser: I'm going to ask this again of Bryan and Andrew, because typically our field operational tests at the most say lasted a year. We didn't see any evidence of that over the year time period that we've tested the system, but we'll turn it over to the carriers, who use them longer than that. Andrew?

Andrew Boyle: That's a tough question. I'm not sure if I am an expert; I guess it's a very subjective question. I'd like to think not. Really, nothing would change. The only thing where you could maybe become complacent is when you're in Adaptive Cruise Control. We've never had an incident where someone was too reliant upon that and a crash resulted. It's pretty obvious—if that is not functioning properly, you can always take it out of cruise by stepping on the brake. I'm not sure—in the lane changing, if you're relying upon the Radar Side Sensor or the Video Camera, that's an area where potentially if you became too reliant on that, and maybe its coverage didn't get quite the blind spot that you were concerned about, that could be an issue, but we haven't found that to be the case.

BCVS: *How are the efficacies calculated?*

Amy Houser: The efficacy rates that we use, the range, primarily, first we got the efficacy rates from our field operational tests. I don't know the equation right of the top of my head, but it looked at potential after testing these systems what were the events that these systems could potentially have prevented. There is great detail in how those were calculated. For Roll Stability Control, as I said in a previous webinar, the system we tested originally in the Freightliner field operational test did not use foundation braking. That system, after that field test, the system that's currently on the market, uses foundation braking which means the system is better than the 20 percent efficacy estimated in that field test. We did simulations. Actually, Battelle Memorial Institute did a simulation of the types of situations in the field operational test, and they came up with that 53 percent effectiveness rate. Some of the effectiveness rates, we polled carriers and we asked them. So it was based both on our own field operational test data and then the other end of the spectrum was information provided from carriers, because many carriers do keep track of their crashes and the use of these systems. It came from both sources.

Dan Murray: Amy, let me just point out that that was a really good point you made. Essentially, any crashes that occur at the motor carrier level that are under the deductible ceiling don't hit any public radar screens in most cases. The vast majority of them, over 90 percent of those are property damage only and often times happen in private facilities even. That is why it's critical to have sort of a good mix of insurance and carrier data so that you're getting the full universe or environment of the crashes.

Kirse Kelly: Operator, are there any questions on the phone?

Operator: We have a question from the phone at this time. Heather Hamilton, your line is open.

Heather

Hamilton: *Thank you. Has anybody heard of the Brake Stroke Monitoring Technologies? If so, do you know any tests that have been performed using them?*

Amy Houser: This is Amy. We did do work here at FMCSA on Brake Stroke Monitoring systems. It wasn't one of my specific projects. Another engineer here led that project. We do have information about those up on our Website. I have some product guides that I actually developed, and we have one on Brake Stroke Monitoring Systems. I'm definitely not an expert in them, but it gives you some basic information about them. I do believe that also under our list of many reports, I believe that there is a report on Brake Stroke Monitoring Systems that was completed. If you can't find it, I'll make sure I can get a copy to you electronically about those particular systems.

Dan Murray: Amy, ATA's Technology and Maintenance Council has also done some research and either is developing or has produced a recommended practice on Brake Stroke Monitoring.

Kirse Kelly: Okay, anyone else on the line operator?

Operator: Your next question comes from Jim Vertigan. You may ask your question.

Jim Vertigan: *I am an insurance broker. I was kind of curious. I agreed with the comments earlier that it's an approach by underwriters who want to see results. One comment to that is if you got somebody in that \$50,000 or \$100,000 deductive range, to maybe laser out and look at what a next higher deductible would do: how much would be potentially saved, particularly if some of the devices we're talking about might eliminate claims in that severity layer. Anyway, here's my question. I'm curious. From the carriers, have you had success or has someone in your organization had success going to your customers and talking about how this investment would make a difference from a reliability standpoint or service perspective? Has that, maybe not specifically them coming back and saying, "Oh yeah, because you have this we're going to pay you this much more," but have you found it to be substantive with your customers? Your shippers? Has there been any kind of positive impact upon the rate based on as a motor carrier, you're making this investment?*

Andrew Boyle: This is Andrew. In our case, we do make that sell, but it very much depends upon the segment of the industry you are in. I attended an ATRI board meeting a couple of months ago and that concern that we have is shared by many carriers—that you can't do it for the sake of getting an extra few pennies out of a shipper, because unfortunately we, in trucking, are our own

worst enemies in many cases. There's always "Joe Schmoe" who'll do it for five cents less a mile. Based on the segment of the industry you're in, you can certainly make that case. If you're hauling fuel for a major oil refiner, then they have too much exposure; or a Fortune 500 Company that makes some other sort of safety sensitive commodity, then they don't want their name across the public press and the risk of an accident is too great for them, as well as perhaps, if you share the risk with them and mitigate that risk by deploying safety technologies, then there should be a benefit to them as well. I know many carriers do try to make that case. That's a great question.

Jim Vertigan: Probably the parameter that would be, I just thought of, that would be most indicative is shippers who keep a scorecard, use it effectively, not just for the sake of having one—they're going to come with the mindset to at least talk about it.

Andrew Boyle: Yes.

Jim Vertigan: Okay, thanks.

Kirse Kelly: It is a little after 2:30 now. We are going to go ahead, if Andrew, and Bryan, and Dan can stay on and we can stay for a while longer, and answer a few more questions.

Mike Harrold: *Is it a fair analogy to compare this technology to that of the airplane cockpit? To me that would help sell benefits to drivers.*

Amy Houser: Bryan or Andrew, I guess—talk about what some of the drivers like. Do they like the technology or—?

Bryan Cook: I think from our attention standpoint it is a benefit, especially to the drivers. As we roll technology out, and the more technology we put in the cab or the tractor, giving him extra sets of tools, it may provide some bragging rights, if you will, with some of the carriers that may not be doing that. I think to answer the question, yeah, I think it is selling point to the driver to have technology and tools in place to support him and is in his everyday job.

Andrew Boyle: Yeah, and I think that is a great analogy. In recent years a big crisis in our industry has been professional driver turnover and the turn rate all that. One of the greatest speakers I saw on that topic said we need to start treating these people more like airline pilots than "stupid truck drivers," and that's a great analogy. Given the responsibility that professional drivers have these days and all the stresses they have to endure, to treat them more like an airline pilots is a great analogy. That's a great question.

Amy Houser: I agree. I've just ridden in the truck and I am amazed at the dash on the truck compared to a light vehicle.

Robert Prim: *Have the carriers experienced much driver tampering with these devices?*

Amy Houser: Have you experienced any of that? We always hear that about that there are ways to circumvent these systems—either Andrew or Bryan?

Andrew Boyle: Yes. In our case, that is a concern on a couple of the devices. We had, with the Side Camera, for example, when we first implemented it, one gentleman told us, “Hey, this is a dumb idea. I’m just going to use this as a hat rack.” Two weeks later, he came across the hood of another brand new Kenworth in a truck stop in Texas and proceeded down the road because he did not see that when he came across it. Sure enough, there was the claim that it could have been prevented had he used that tool. So he was not a long-term employee with us. You are always going to have a small percentage of outliers that don’t want anything to do with anything—“Trucking was better 30 years ago”—but that’s not the standard I think you want people to reach. You do have to implement some sort of a check and balance in the maintenance system to ensure that these steps that you’re taking and all this investment you’re making is not going for naught.

Kevin Warner: *As a follow-up to that, do drivers have the ability to turn off the audible warnings and the SmartCruise?*

Amy Houser: In our field tests, we did not allow them to do that. I don’t know in the real world, do you allow the drivers to adjust the warnings?

Bryan Cook: One of the operational questions to drivers when it comes to these systems—those alerts are probably the biggest complaint that drivers have about the systems. While we don’t want them to turn them off, we may allow them to adjust the volume of the alert or whatever, but we would really like them not to disable or shut that off, if at all possible. Generally we have done a very good job of preventing them from doing that. Just like any other technology, it could be disabled either by breaking the system or some mechanical method or other method of disabling it. In those cases, hopefully you are able to detect that either when the driver comes in or during normal maintenance cycles. It’d be nice to be kind of able to detect that while the driver was driving down the road, but that is one of the gaps we have seen in some of these safety systems.

Kirse Kelly: Operator, do we have any questions on the phone at this time?

Operator: At this time there are no further questions.

Cary Hall: *How effective is Roll Stability on units pulling doubles and triples?*

Amy Houser: I know that with doubles, I’ve got some film clips from one the system suppliers for the Electronic Stability Control, so I know that it can be used on the doubles. I’m not 100 percent sure on triples. Bryan, do you use any of these systems on doubles or triples?

Bryan Cook: I don’t have any data on the triples. I know we do use it on doubles.

Amy Houser: Have you found it to be effective?

Bryan Cook: I don't have anything other than anecdotal data to say that we think they're effective. I don't have any hard numbers right now to be able to tell you.

Amy Houser: We didn't test them on doubles or triples. I've seen a couple of the film clips for doubles with Electronic Stability Control.

Gary Hunt: *Does Mr. Boyle have the estimated payback for the use of automatic transmissions?*

Andrew Boyle: Certainly a reasonable question, I think. The up charges, I want to say, are a couple or a few thousand bucks. As I'm sure the questioner knows, the theory behind automated transmissions is that they should shift more effectively and smartly and optimize the transmission, the engine, and fuel economy, all these things by shifting more smartly with the parameters that are set according to all the specifications of the tractor. In theory, I guess, you could pay it back by—if you are using inexperienced professional drivers that are just learning, then they should not be able to shift as effectively as the automatic transmission would. We have actually found—the product that we use is the Eaton Ultra Shift in all of our fleet and have for a number of years now. Because that's essentially been built on a product that has been around for 20 some odd years, we have found that the maintenance of that has not been an issue at all and the field support is excellent. We've had very good performance and would highly recommend it.

John Backowski: *What does the future look like for these systems to be mandated by regulators?*

Amy Houser: FMCSA would not be the agency that would determine on its own to mandate these systems; essentially, the National Highway Traffic Safety Administration would. If they determined that there was a need for a mandate for these systems that they would be the one that would look at those. Do keep in mind that for light vehicles they have passed a mandate related to Electronic Stability Control. We partner with NHTSA. We've learned from each one of the activities and tests and those kinds of things that we work on with our sister agency together. It will have to be the result of some of the research that's ongoing and will be in the future whether or not that determination is made related to any regulation.

Dan Murray: Amy, you have made a point. We have had a number of questions where people are asking about different vehicle configurations and efficacy and relevance. One of the things that the cost-benefit assessments do is that it essentially looks at exposure by vehicle miles traveled, which is a relatively good indicator, assuming the vehicle configuration is generally appropriate. It's a relatively good indicator to see the value of the systems based on VMTs; certainly, automatically you're not going to get straight trucks at the hundred

thousand plus a year, typically. You're also not likely to get five axles long haul over-the-road truck load at the 40,000 miles per year. Using VMTs, the carrier could then, sort of self select themselves in this continuum a range of VMT exposures to see the cost-benefit returns for them. I think that's an important piece of the research that was done.

Amy Houser: Again, some of the research we are also thinking about in the future is some folks have asked about things such as the tampering and the driver, if they are ignoring warnings, or those kinds of things. One of the things we're looking at in the future is to work with carriers that are deploying these systems and trying to learn more about what's going on, the crashes they're preventing; looking at potential ways that onboard monitoring can be integrated with these systems that can help the carriers easily get information about what happens when these systems activate or other types of conditions. We are looking at many of these things in the future too. That's just something to note.

Mike Harrold: *What are the reductions or real stories your drivers have come back with that support the use of this?*

Andrew Boyle: I guess I would point to our survey results, first and foremost. Those of us in trucking know that we have an excessive amount of candor among our professional drivers. People are very straight talkers, at least the ones that we deal with. They're not shy about sharing their opinion, so I don't think that folks would complete a survey simply trying to make us feel better. We have a pretty open relationship, to put it diplomatically, with most of our folks. Their overwhelming response is that most of these things really enable it to prevent accidents. Anecdotally, people will mention, "Hey, I was almost going to change lanes, and here I had this notification that someone or something was in my blind spot." That happens all the time, so there's plenty of anecdotal evidence. And hopefully that little sample survey was useful.

Robert Griffin: *Do you see this technology moving into private passenger fleets or vans?*

Amy Houser: I did give a presentation awhile back to the motorcoach industry and in addition, one of my colleagues, I know, I helped prepare a presentation; she was doing another presentation for the motorcoach industry. I do know that they are very interested in many of these technologies, which are applicable to buses. I know, for instance, Electronic Stability Control, again, I have another video from one of the system suppliers that shows the technology on a motorcoach. There is definite interest. Some of the technologies, such as the Brake Stroke Monitors, did involve that testing. I believe it's that or the tire pressure monitor. I don't know right now off the top of my head at this moment. We do often involve the motorcoach industry in our tests, in addition, just depending on the situation. They are definitely interested in Onboard Systems as well as the trucking community.

Mike Harrold: *Is there any reliable data that compares crash experience of trucks equipped with and those not equipped?*

Amy Houser: That actually is going to be one of the future evaluations that we are going to look at. In fact we hope to look at that once the work statement gets out there. Over the next year or two years, trying to work with the carriers looking at—hopefully some of them will be willing to share their data and probably sign nondisclosure agreements, so I don't necessarily relate it back to a specific business, but just look at several different carriers, if they're willing to share some of their crash data they have collected. Then we could potentially collect some in the future relating to what's going on out there with the trucks that are equipped with these systems versus non-equipped.

Kirse Kelly: Okay. We have just one more question. Are there any questions on the phone line?

Operator: Not at this time.

Mike Harrold: *How big of an issue is sensor or lens fouling? Does it impair effectiveness?*

Amy Houser: I am presuming that—I don't know if this is an issue. I know with lane departure warning systems they say often you have to have a clean windshields, I don't know. Is there anything else that Brian or Andrew can think of?

Andrew Boyle: Certainly the sensors can be rendered useless. For example, the front facing radar unit. If you get in a collision and your front fender is damaged, then there is a high likelihood that that it is going to render that unit useless. The good thing is, the way we always look at add-ons like this is, does it shut down the truck? If it's going to shut down the truck that's a different equation, but if it does not, like in this case, you can continue to roll and get back to it at your earliest convenience, so that's something you can work with. The Lane Departure Warning—weather has not really been an issue with those, but with construction on the interstate or similar kind of odd environments, then we do have the capability to—the driver can push a button to turn it off, I believe for 10 minute intervals. That might answer another question from before. I think these products have been improved to the point where the general conditions including weather are not so much of an issue, but if you have other environmental impact on the devices, then you can overcome them and it's not going to shut down the truck.

Amy Houser: All right. I believe that's the end of our questions. I do want to send a special thank you to our guest speakers, both Bryan Cook and Andrew Boyle, for taking time out of their very busy schedules to participate in this webinar. I truly believe that hearing about their firsthand experiences with these systems is especially valuable as we learn more about them. We also value our audience participation in these webinars and definitely would like to hear

more if you have interest in future webinar topics. You can provide this on the evaluation form that Kirse is going to be talking about.

I did bring this up a little bit earlier, but if you do need more information about research that's being conducted by FMCSA, please visit the facts and research page on our web site. Also we have technology product guides up there that can provide information on these and other safety systems.

Our analyses for these three systems, I hope to have them out over the next month or so. We will send out an e-mail blast to everyone participating in the webinar that that information will be available up on the Web site.

If you have any further questions relating to what we did or some of the findings please feel free to call me or Dan Murray.

Kirse Kelly: Okay. I just wanted to follow up on Amy's comments, that we would just like to ask you to fill out our evaluation and let's know your comments about the webinar and suggestions for future webinars.

To insert those suggestions you just type comments in this space at the bottom of the pod and click the arrow. Those comments can be viewed by all participants in the meeting room, so if you want to remain anonymous, just click on the arrow towards the right of everyone and choose FMCSA Host. You can also download a PDF version of the presentation if you have not done so already.

As a reminder, of members of the trade or local media who are participating in today's call should or can contact our Office of Communications. That phone number is (202) 366-9999.

Amy Houser: And that's if you have questions that you're going to be using in a publication or that kind of thing.

Kirse Kelly: Once again, thank you for participating in our webinar and please check the ART website for FMCSA to register for future webinars. Registration usually opens one or two weeks before each webinar. Last I would just say, if we close the lines, Operator, but please keep the lines open for the speakers so that we could just have a follow-up.

Amy Houser: Thank you.

Operator: Thank you. One moment please. This does conclude today's conference; you may disconnect at this time.

[1:34:46]

Editor's Note: A poll was given to attendees at the beginning and end of Amy Houser's presentation:

Question: What type of crashes involving large trucks are you worried most about?

Before presentation (76 total responses):

Rollovers	20%	(15 responses)
Run off the road	8%	(6)
Collisions	56%	(43)
Loss of Vehicle Control	16%	(12)

After presentation (75 total responses):

Rollovers	32%	(24 responses)
Run off the road	7%	(5)
Collisions	56%	(42)
Loss of Vehicle Control	5%	(4)