UNITED STATES OF AMERICA

NATIONAL TRANSPORTATION SAFETY BOARD

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Investigation of: *

POSITIVE TRAIN CONTROL
SPECIAL REPORT *
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* Report No.: DCA21SR003
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Interview of: SAM ALIBRAHIM, Chief of Train Control and Communications, Office of Research and Development Federal Railroad Administration

Via Microsoft Teams

Wednesday,
October 6, 2021

APPEARANCES:

JOHN MANUTES, Rail Investigator
National Transportation Safety Board

GREG SCOTT, MA, Rail Accident Investigator
National Transportation Safety Board

RUBIN PAYAN, Electrical Engineer
National Transportation Safety Board

I N D E X

I N T E R V I E W

MR. MANUTES: Okay. Okay. Good afternoon. My name is John Manutes. I am an NTSB Rail Investigator. Today is October 6th, 2021 and we are meeting virtually via Microsoft Teams to conduct a meeting with Sam Alibrahim, who is employed by the Federal Railroad Administration.

This meeting is in conjunction with NTSB Special Investigation Report regarding positive train control systems. The NTSB Reference Number is DCA21SR003. This interview is being recorded. We will transcribe the interview and provide a copy to you, Sam, for your review. A text transcription will be placed into the docket for this report.

Before we begin, we'll go around the room and introduce ourselves. I'll start off and we'll just call on individuals so we don't talk over each other. Please spell your name and state your title, and I think we can get started.

My name is John Manutes. The spelling of my last name is M-A-N-U-T-E-S. I am an NTSB Rail Accident Investigator for this report.

Greg?

MR. SCOTT: Hi. My name's Greg Scott. Last name is S-C-O-T-T. I'm an NTSB Rail Accident Investigator for this report, as well.

MR. MANUTES: Rubin?

MR. PAYAN: Okay. My name's Rubin Payan, P-A-Y-A-N, and I'm

an electrical engineer at the Office of Rail Safety with the NTSB.

MR. MANUTES: Make sure to -- okay. Sam?

MR. ALIBRAHIM: My name is Sam Alibrahim, last name spells A-L-I-B-R-A-H-I-M, and I'm the Chief of Print Control and Communication Research Division at the Office of Research and Development at the Federal Railroad Administration.

MR. MANUTES: Okay. Thank you, Sam. I really appreciate it. Thanks for meeting with us today. Thanks for bearing with all of us on all of our scheduling issues on our side. I really appreciate it.

I am going to pass this -- my notes say to Rubin. So I'm going to pass this to Rubin. I did not prepare a bunch of questions. I just wanted to get an understanding. I think we all just want to get your thoughts on some of these things. Maybe Rubin can ask the first open-ended question and we'll just be really casual. This isn't going to be a bit formal interrogation by any stretch of the imagination.

So, Rubin, why don't you just go ahead.

MR. PAYAN: Okay. All right.

INTERVIEW OF SAM ALIBRAHIM

BY MR. PAYAN:

Q. So as we talked earlier, this special investigation we're doing is kind of to address some of the -- the newer elements that PTC were hoping migrates to. We've had some accidents where restricted speed has come into play, restricted mode and then --

and the single point failure with dispatchers and -- and work authorities.

So we were hoping were hoping that you might be able to tell us what FRA is envisioning for the -- for the next version of PTC or any upgrades that are being worked on right now.

A. Okay. Sure. So just as a background, obviously PTC is designed to be an overly system on top of vital signaling systems that are -- that govern the movement of trains on the network, and that's how the railroads chose to -- to deploy PTC.

So it's a safety system. It's an enforcement system that will stop the train in the case of potential accident or -- or the train operator not adhering to the speed commands or speed restrictions and so on. So it's to prevent train to train collision.

And it's not an off the shelf system. It's really a system of systems, you see, and so each deployment is a little bit unique, you know, but the underlying technologies are the same, you know. They're the ones that are -- that the railroad's submit their safety plans on and the Office of Safety, the FRA, will approve and allow them to be deployed.

So ever since 2008, we start the development of the subsystems of this -- of what we call PTC. So our role in the R&D side is to help the railroads reach the mandate deadline, at least the first one for December of 2015.

It's a huge -- it was a hug undertaking and but that's what

we saw our role is to facilitate and help guide the development of these subsystems that are -- that are acceptable by all the railroads, and that's a key for us is that for interoperability purposes, all the railroads have to agree to the technology and the specification and the performance safety and interfaces and performance requirements.

And that's what -- that's what we forged that partnership between us and the railroads and under the umbrella of the AR. And so obviously, there was a bit of a delay in deployment and but now the PTC 1.0 is deployed throughout the network.

You were asking about gaps. It's really a railroad by railroad situation but, in general, the freight railroads are almost 100 percent there. I mean they're a lot more, let's say, able to deploy. It's a major -- I mean it's north of $15 billion of investment, you see.

The -- on the passenger side, there might be some delays and there are some gaps there, again, because of the -- the financial requirement to deploy that technology.

Now since 2015, at -- well, actually, no. In 2017, R&D started looking at the next generation of PTC. We're always trying to be ahead, you know, five years or more from the current deployment of technology. So and with -- and it was also good for us -- because don't forget, under PTC 1.0, we were reacting to a mandate with a deadline that was put down by Congress.

So the next time around, we thought we need to be, you know,

definitely proactive and looking forward to the -- to the next generation of this technology without that looming deadline and the craziness that went along with that, you know. So the railroads -- so now, if you look at our research program, it's really in three different buckets.

There is one portion or one bucket deals monitoring the deployment of current PTC. So we're collecting tons and tons of data on all the systems there -- as they are deployed and as they are running to get -- to develop and do some data analysis to develop potential trends. We're trying to see, you know -- measure performance of the system and help the railroads in remedy these situations better potentially they're seeing in their deployment.

The second bucket is next generation PTC, which we call, you know -- I called it 2.0 and it kind of stuck for now this -- the term stuck, I guess. But anyway, so this -- this is building on the current PTC technology but taking the whole signaling and train control really into the next century, if you will, because it's really a paradigm shift, because -- and we are all signalmen and you understand, you know. Right now, train movements are done on -- based on fixed block signaling, you know.

So the track circuit is really the heart and soul of train detection, as well as train tracking, and we all know, you know, because of the track circuits and their lengths and so on that precision is not -- is not very accurate and tracks have provided

both, rail integrity indication for rail breaks and so on, as well as the approximate location of trains as they're moving around the network.

In 2.0, in PTC 2.0, we want to, more or less, separate those two functionalities. We're having, like, the track circuits will make -- will be optimized to provide track integrity, because we want to know if there's a rail break or, you know, but the train positioning and tracking will be done through satellite navigation and -- and a high precision, what we call, positive train location.

It's a technology that we have developed that can provide the location of the front end of a train and the back end of the train within -- within seven inches.

Q. Wow.

A. So it's a very, very powerful -- and we're going to improve on that even more. So and that gives us, that gives the operating railroads a lot more flexibility in train movement, as well as increasing rail capacity because, you know, as you know, you know, you can have, based on the -- all fixed block signaling, you would have, like -- I don't know if the -- if the train is one mile, you have another mile ahead of him and another mile behind him in terms of buffer -- safety buffers and so you've wasted three miles or more of track to -- and if the -- and that is the same if the train is, like, two locomotives and three cars or something.

You know, so it's a crude technology but now we're going to

-- it's going to be, you know, the -- the train locating and tracking is going to be kind of -- oh, the envelope of safety's going to be custom-made to that particular train as it moves down the line, you see.

And so that's the second bucket of research, and then the third one is on automated train operations. I mean technology has evolved. Microprocessor is becoming more powerful and more accepted and so automated -- a lot of, you know -- a higher level of automation is being introduced and into the operating of the train.

So we have developed six levels of automation all the way from no automation all the way to autonomous train operation, you know. We -- and all of these are backward compatible and so because not all railroads going to deploy the technology, you know, formally, you know, so some railroads will be at Level III. Some will be at Level IV. You see what I'm saying?

But they all have to coexist, so that's why when, right now, we're putting together the performance specifications and the requirements for the suite of censors, you know, what type of censors how -- and what kind of performance you get out of the different sensors that are needed for the various levels of automated train operation.

And with that, we're going to -- there's quite a bit of positive outcomes, you know. You're looking at better fuel management in terms of -- also better meet and pass timing and

train -- basically increasing the average speed of the train throughout the trip, that sort of thing.

So that's -- and this is a vision that takes us into 2030, this technology that I'm talking about is really looking at fully deploying this technology by 2030. So this is, in a nutshell, where -- where we are in terms of R&D, FRA R&D, and its partnership with the -- with the railroads.

So I'll stop a minute here and see if that answered your question and, you know, if you want me to delve into --

Q. It --

A. -- a specific issue.

Q. It did answer my question, but it kind of makes me want to get my hands dirty and get into the gritty of it now.

A. Yeah. There's a lot of exciting stuff coming down the --

Q. Yeah. Yeah, yeah. Absolutely. So how about any work on -- we had a couple of accidents in underground on the passengers coming into New York where the (indiscernible) --

A. Yeah.

Q. -- block.

A. Yes, and that's the terminals, is that what --

Q. That's --

A. -- you're talking about, the terminal? Yeah, yeah. That's, again, the original mandate kind of left it open, you know, the -- the PTC mandate, and so it was a main line safety system. It kind of stopped short once you get into the terminals and you get off,

you know, to the yards and that sort of thing.

We have -- we looked into this issue. We researched what's, so-called, restricted speed PTC -- seeing of PTC is viable for this kind of, you know, sub-five mile an hour movement, and it is possible.

The issue here, the -- the complexity of the signaling system at the terminal, you know, with track circuits being few, you know -- a few yards long and -- and just the environment there is -- is not conducive, and then so the railroads are -- I mean it's viable but it's up to the railroads to deploy this.

Plus we have to bring in the satellite signals, you know, again from open sky into -- into the underground structure and so we do have an onboard sensors that will maintain the precision of the -- of the train with tachometers and other sensors that will help maintain the precision, but that will be drifted off after, you know, quarter of a mile or half a mile kind of movement, you know, that -- and this is something we're working on and for the next generation PTC.

We're trying to improve on that -- on that ability to where if a train can go in a mile long tunnel, we want to have the same precision and we're driving hard to make that happen because, you know, again, moving into what we call full moving block technology, as opposed to fixed block, you really -- the secret sauce is that you have to have a high precision and accurate and 100 percent available system that will accurately position the

train within inches, you know, and that's --
Q. Yeah.
A. -- something we have to be maintained, yeah.
Q. Yeah. That's the trick, especially when you're underground with --
A. Exactly.
Q. Yeah. So are the tachometers and gyroscopes, have they been developed enough to provide that accuracy?
A. Yes. We do. They, again, they will drift after, right now, about half a mile or so, but we want to -- but we want to go even beyond that and -- and just to have the solid belief in this -- in this equipment, yeah.
Q. Yeah. Okay. No, very good. So the other area that caught my attention was the positive train location.
A. Uh-huh. Yeah. That's --
Q. So is this going to replace PTC or is it going to augment --
A. No, no. This is part of PTC.
Q. Ah.
A. Positive train location is really an integral part of PTC. We have basic -- what it is, it's a system made of a head end onboard computer and antennas and then a back end or end of a train, you know -- the end of a train divides that -- this, the end of a train segment of positive train location is integrated into the end of train device, okay?
So they -- and then there's a radio link between the two --

Q. Uh-huh.

A. -- between the two segments and we have developed that already and -- and it's deployed by railroads. As a matter of fact, Wabtec is manufacturing and actually selling this the -- as part of their line of products that they sell.

We want to improve on the link, on the data link because, again, trains go through canyons and, you know, foliage and, you know, all of that and so we experienced and collected a whole of data on the performance of the radio.

So and we have few radio frequency bands that we can -- we can work with, you know. Some of them are more susceptible to, you know, foliage and obstructions and -- because of their propagation. So we're working on that to improve it for the next generation.

But that's the -- positive train location is part of PTC and it informs PTC for, you know, once every second the precise location and where the system will calculate the length of the train. So it plays into the integrity of the train also just in case, you know, train breaks -- breaks apart in travel so you know what's going on there.

But that's a very -- we're very, very proud of that technology and we really got the precision so precise that we can differentiate between the head end of a train -- of two trains side-by-side on two tracks next to each other, you know --

Q. Wow.

A. -- with the tracks being 13 feet center to center, you know, we can tell which train is which because, you know, you need to know that, and when you're -- when you're crossing tracks, you want to know if your end of your train has -- has cleared the track number one, if you will, and --

Q. Yeah.

A. -- or cleared the switch borings and so it's -- it provides that kind of precision and I'm very excited about that.

Q. So will it be good enough to make the rear of the train a target in PTC or will it just be calculating the distance from the head end?

A. Well, the main brain is it's a master/slave kind of situation, but the main computer or the main brain is at the head end.

Q. Uh-huh.

A. But it's in constant communication with the back end. It's the back end is just really providing, because it also has a satellite communication. It's providing location -- it's location constantly to the front end to use and its calculations in calculating and making sure the trains is intact and -- and other calculations, which is, like, the -- the brake profile --

Q. Uh-huh.

A. -- because the system has to calculate its breaking curve constantly just in case it has to deploy the -- the braking in an emergency situation.

Q. Oh, okay. The reason we're asking is we've had a couple of accidents in restricted speed where on train's following the other --

A. Yeah.

Q. -- because the rear end isn't marked, the train catches --

A. Yes.

Q. -- the other one. In PTC --

A. Yeah, and it's to solve this issue is what -- why we developed, you know, the positive train location. It's --

Q. Oh, okay.

A. -- because what happens is that the -- in PTC 1.0, the way the railroads calculate their -- the location of the back end is they know precisely what the front end is. They know how many cars they got in the train and that gives them where the back end is, which is not very precise because when the track -- when the train leaves the yard, if somebody puts the wrong number of -- of cars, you know what I'm saying, that will --

Q. (Indiscernible).

A. -- mess up the -- yeah. That, it's not a, you know, full proof kind of methodology. But with positive train control, no, that is calculated constantly, you know. So it's --

Q. Wow.

A. -- it's a (indiscernible) and, you know, it gives you the precision and the confidence, you know.

Q. Yeah. When we were -- I was talking to Webtec last -- well,

two years ago after an accident. They were saying their end of train devices were already being equipped with GPS.

A. Yeah.

Q. Not for PTC, but just for the railroads to track their -- their end of train in case they got lost on another railroad.

A. That's right. But, see, we take the GPS signal, but we do a lot more calculations on it with -- to make it a lot more precise. I mean GPS signals that they can give you -- I don't have the numbers, but I would say 15 meters, within 15 meters, at 95 percent confidence.

That means the train could be here or it could be 30 feet away. It's not precise. It's definitely -- so that's what positive train location, it's a -- it takes the GPS signal, takes the correction.

Also there's the terrestrial stations that will do a correction for you for the signal, as well as the onboard sensors to come up with a very precise -- it's a -- the contractor is Lydos, SA -- or previously known as SAIC, and they brought this technology from the military actually, and so we're -- we're bringing it to, you know, to our domain or our application. So that's why we're able to provide that precision, and this system is being deployed, you know, by railroads. I don't know how big the deployment base is yet, but Webtec came out with this product line I think last year, maybe a year and a half ago or something like that, based on the FRA's research and --

Q. Okay.
A. Yeah.
Q. I saw that FRA put out a report probably a year or two -- two ago on the high accuracy GPS. Is that being developed or is that in place now?
A. It's -- do you know the exact title? Because we had -- we have a lot of research into this -- in this area.
Q. There was two reports and I --
A. Yeah.
Q. -- I don't -- I'd have to pull them up. I don't remember the exact title of them, but --
A. Okay. But they're in conjunction with the positive train location. They've got to be --
Q. So everything --
A. -- and that's --
Q. -- everything's being worked on a --
A. Exactly. Yeah, because --
Q. Okay.
A. -- you have to improve on all of these bits and pieces to get the performance that we're -- we want, because in our research, there is an advisory group typically that kind of guides the research, and the advisory group is made of railroads, academia, industry, you know.

And so we get both the theoretical, as well as the real world needs and what those guys bring to the table and that's why, you

know, when they decide what kind of precision is required and what kind of confidence level is required for the system to be successful, we rely on them to --

Q. Okay.

A. -- to guide us on that, yeah.

Q. So to put you -- I'm going to put you on the spot. If the railroads did decide to -- to PTC on all the lines, on all the main tracks, would there be enough spectrum for them to do that right now?

A. Well, the spectrum issue is always a problem.

Q. I mean --

A. Yeah. The thing is, the -- they started a company called 220 LLC --

Q. Uh-huh.

A. -- they -- and they wanted to grab as much of the 220 megahertz spectrum as possible across the country. I mean ideally, if there was a, you know -- a special safety spectrum dedicated to railroad operation, you know, that covers the whole United States that would have been great, but -- but that's not the case.

So they're grabbing whatever they can that is free around the country and -- and to be able to use it. The -- for the minimum basic require -- safety requirements, the spectrum can do -- we can do with that. But the railroads are looking to add more functionality, you know, more functionality that goes beyond

safety. Functionality that goes into their business models, you know, to help them recoup their investments, you know.

Q. Uh-huh.

A. I mean they put billions of dollars there. So they want to track their -- the trains. They want to track the shipments and what's -- whatever the train is -- because don't forget, I mean, they're competing with the trucking industry and --

Q. Sure.

A. -- they want to be as efficient, as customer friendly and provide as a precise, you know, information to get customers (indiscernible) --

Q. Yeah.

A. -- as possible. So they're going to -- they need to squeeze out more throughput out of this -- this spectrum and we're -- we did some research to help improve the compression algorithms, in addition to cybersecurity research that -- that would help fortify the communication.

But, yeah, the spectrum is an issue and --

Q. So it is? Okay.

A. Yeah. Yeah, yeah. It still is.

Q. All right.

A. As the requirements increase, you know, because as the railroads see the benefit of this digitization, or what I call digitization of the -- of the network, of the railroad, they see all of these benefits and they want to take advantage of them and

then --
Q. Yeah.
A. -- from that, you need the spectrum, the pipeline.
Q. You're plugging it up. Yeah. No, I've seen in the last two years where a customer can actually type in and it'll show where his shipment is on the system. So --
A. Exactly. Yeah, yeah.
Q. -- that takes --
A. I mean --
Q. That takes data.
A. Exactly. Yeah, and they want to come from the West Coast to the East Coast in three days, you know, as opposed to, you know, a week or more and --
Q. Uh-huh.
A. -- and that whole thing with the, what do they call it, precision railroading model?
Q. Yes. Yeah.
A. I forgot the actual --
Q. So the schedule railroad --
A. That, yeah.
Q. -- (indiscernible).
A. PSR. That's -- yeah, and, of course, there is some controversy about that. But they're all trying to get to be more efficient and more responsive --
Q. Yeah.

A. -- to their customers.
Q. Yeah. Trying to stay competitive. Sure.
A. Yeah, yeah.
Q. So switching channels here. Do you or your -- or somebody from your staff participate in the interoperable train -- train committee -- train --
A. Interoperable Train Control Committee? Yeah.
Q. Train Control Committee. That's the one.
A. Yeah, yeah, yeah, yeah. Yeah, we are. We are members of that committee and that's a, you know -- that's a big -- a big hurdle for the success of the deployment of PTC, and it's one of the four requirements that the Congress has mandated that the system be interoperable and --
Q. Uh-huh.
A. -- yeah, so we are fully engaged with that in that --
Q. Okay.
A. -- committee and then --
Q. Okay.
A. -- and actually, you know, we take -- we take interoperability as a guiding principle as we're developing technologies, you know, especially now with the next generation PTC.
Q. Sure.
A. Operations (indiscernible).
Q. We made a recommendation to them last year following the Cary

accident about trains operating in restricted mode --
A. Uh-huh.
Q. -- and I think they just made the change about every -- if a train travels so far, he's -- the engineer's going to get a prompt to acknowledge if he still wants to be in restricted mode.
A. Yeah.
Q. Is there any work as far as the next generation PTC to -- to eliminate that human element part if an engineer leaves it in restricted mode too long with a --
A. It's -- at the -- at this year's research we're following, we don't have that. But it will be coming in the upcoming years, because as we're -- as we're improving on the different technologies or the subsystems, then these kind of functionalities will be a natural, you know, plop in kind of -- kind of thing, you know, where you can take advantage of the technologies -- or the software that you have developed to all for this -- for these kind of functionalities. Yeah, yeah.
Q. How about from the dispatcher's end? We had an accident PTC territory where the dispatcher accidently removed the work zone authority for a crew and --
A. Well --
Q. -- it went in on them.
A. Oh, that's -- from worker's protection, we do have -- we have developed, what we call, employee in charge portable terminal. So the gang leader will have, like, an iPad type of device. As the

work zone being established and the guys are doing their thing who -- maintenance or whatever, he will have the authority to let the train come in into the zone.

So at whatever speed the -- that the Form B has required the train to enter the zone. If the train operator did not adhere to that, in other words didn't lower its speed going into the zone, PTC will take over and stop the train.

Q. I see.

A. So if the dispatcher had removed the -- the speed restriction from the office side, the employee in charge has to -- has to get an alert for that. Do you see what I'm saying?

Q. Uh-huh.

A. In other words, there's a status change and he would --

Q. Uh-huh.

A. -- be -- would be made aware of that automatically.

Q. Yes. Okay.

A. So that's what now Webtec, we're waiting on Webtec to do a new version upgrade that will include this functionality in the onboard computers.

Q. Oh, wow. So --

A. On the (indiscernible).

Q. -- just about this tablet, is it a company, a railroad or FRA?

A. I'm sorry?

Q. Who's developing this tablet (indiscernible)?

A. Well, it's -- we have developed the software and that could be deployed in a tablet, in a laptop setting. I mean it's independent of the hardware platform.

Q. I see. Okay.

A. See, and so we brought this technology very far over the past few years actually. But now, it needs Webtec to do some software work on the locomotive side to --

Q. I see.

A. -- to be able to integrate this in.

Q. I see. Okay. Okay. That makes sense. Okay. So finally, before I -- I know I'm hogging up the interview here. The -- how about PTC and grate crossings? Is that in the works for the future?

A. That's -- it needs some -- we've been talking about it and it needs some meeting of the minds, if you will. Traditionally, railroads have kept signaling systems and crossing systems separate for -- for many reasons, you know, and so there is a push now for -- for integrating the two somehow and that's still in the -- I wouldn't say negotiations, but that's still in the thinking process, how to do that, because railroads, you know, they -- they met the requirements for PTC as it stood.

Adding these kind of complications when they're already kind of biased against it, you know --

Q. Yeah.

A. -- keep them separate, it's a little bit of, you know, of

soul searching on their part to allow that. Now we have done -- there's a lot of research on the -- done on the grate crossing status being provided to the connected vehicles. Now --

Q. Oh.

A. -- these vehicles, autonomous vehicles, or they call them connected vehicles where they're -- they're equipped with the system safety systems that will tell you, like, you're -- the lane departure, you know, how the LED comes on when we're -- when you're --

Q. Yes.

A. -- creeping on the lane next to you or there's a car getting close to you, it will also beep. So these are collection of safety applications that are embedded in the -- these modern cars, of the connected cars. So we have developed a technology called RCBW, which is the rail crossing warning system.

This is specifically for the connected vehicle. So what we're doing in that system is we're bring the status of the crossing. If it's active. If it's not active. You know what I'm saying? What is the status of the -- of this -- of the crossing bringing it into the connected vehicle.

So the driver will know, as he's heading toward the crossing, what the status of the crossing ahead of time, and the -- as we provide this information over, we started developing the system using DSRC, the Digital -- it's acronym -- I forgot the exact word. But it's a platform or it's a -- it's a protocol, really,

that right now, the connected vehicles are using to communicate with the -- with the weight side or with the -- they call it the V to I, which is the vehicle to infrastructure.

Q. Uh-huh.

A. So we're using that capability that's built into these -- these cars and adding one more safety applications specially for grate crossing.

Q. Oh, okay.

A. To give -- to bring the status of the grate crossing into the cab or into the car itself and to warn the driver and -- and this has the potential of the onboard computer calculating the trajectory -- the speed and the direction of the -- of the vehicle and deciding whether an accident is imminent.

If the train -- if the car operator is not adhering, you know, or -- or acknowledging the warning and the speed of the car is still going, the onboard computer is -- is calculating that he will crash into the side of the train.

So, you know, right now we're stopping at the warning, like, you know, stop, you know, we have, like, three levels of warning, you know. First one is the status of the crossing and then second, you need to brake, the crossing is active, and then the third one is stop.

I mean it could go further by actually taking over and brake -- put it on the brake, but that -- we're holding off short of that because of -- because really the auto industry is the only

ones who can implement this kind of stuff into their models, and we needed their, you know, because of liabilities and so on.

Q. Sure.

A. So we leave it up to them. But we're providing them that information ready to be acted on, you know.

Q. Okay.

A. So there is quite a bit of that kind of research is going on, but -- but ingraining, you know, what you integrate signaling system with a crossing, that hasn't happened yet but it's in the -- it's in the talks. It's in the minds of the railroads and we certainly, in our committees and subcommittees meetings, we bring that up and try to find a way that will be, you know, make it agreeable for the railroads to --

Q. Yeah.

A. -- to make that connection.

MR. PAYAN: No, it makes sense. That makes sense. Well, thank you. Thank you for that. Greg, you have anything? I kind of took up all your time here.

MR. SCOTT: No. You didn't take up mine. Actually, the questions that I had written down I think you've covered. Trying to look here, if there's any that I haven't had answered.

Actually, I think I'm good on just about everything y'all talked about. John?

MR. MANUTES: Yeah. So I was going to ask -- Sam, thank you for all that. I mean I've learned a lot already and you're on the

cutting edge of this, which is interesting. So I think my two questions are maybe a step further than we've taken our conversation so far.

BY MR. MANUTES:

Q. You talked about the third level -- the third bucket being, you know, someday, 2030, being beyond autonomous trains and as part of that, there's a suite of sensors that will need to be developed.

A. Uh-huh.

Q. Is -- pulling in a lot of different unrelated subjects. But, you know, back -- like you talked about the auto industry has collision avoidance sensors happening, different ways to do that, you know, through whether it's LiDAR or radar or machine vision, whatever it is.

Is there any talk about when we talk about restricted speed is more than just 15 mph or 20 mph? Restricted speed is also relying on a human to say I'm within half the range of vision of the thing in front of me.

Is there any talk about using a suite of sensors to help the human determine what is within half the range of vision, a collision sensor for trains? I mean I know that's not going to work at 78 miles an hour on a freight train. But if you're down in the 15 mile an hour zone, is there something that's being worked on in that range?

A. Well, I mean this -- right now, we're putting down the

performance requirements for the sensors. So the -- we're -- and we're testing, you know, off the shelf sensors just to prove some, you know, answer some questions that the Committee has and -- but that will be definitely part of the outcomes that we're looking for.

So it's not just what you mentioned, but also the identification of an obstacle and the classification of the obstacle.

Q. Right.

A. So you see what I'm saying? So it's --

Q. Uh-huh.

A. -- it's one thing to identify there is -- there's something on the track ahead of you, but it's something else to classify it and --

Q. Right.

A. -- and see do you really need to put the emergency brake or is it just a bag of trash or something that you can --

Q. Right.

A. -- plow right through it, you know, and --

Q. Yeah.

A. -- and not risk a derailment, you know. So you've got a declassification aspect is huge to -- to tell, you know, a human from an animal from a, you know, car, you know, all of these different objects that are ahead of the train in a -- in the, I don't know, quarter, third, half a mile distance kind of thing and

so all of these -- these questions are being asked and there are some experiments and testing going on to answer these questions.

Q. Okay.

A. But --

Q. Thank you. That's helpful. So pulling it out of the third bucket, maybe more in the -- in the next five year bucket, one of the things that we've seen is accidents or even incidents or conversations surrounding PTC didn't initialize. Now somebody who's used to running PTC, one of these young guys who, you know, everything's been on his iPhone since he was born anyway is very used to PTC. Now PTC isn't there and there's --

A. Uh-huh.

Q. -- there's functionality, of course, to run your train without PTC, but how does PTC reliability, especially from the initialization standpoint, improve over the next couple of years? Where do you see that going?

A. Well, I see, again, that's -- that's part of the automations that will we're bringing because the first deployment of PTC, and like I said, we were collecting a lot of performance data actually on the operators, as well as -- I mean everybody is looking for that perfect trip, you know, zero to zero, under PTC, completely. There's no in and out of PTC.

There's no initialization problem, and we see these numbers are coming down, you know, the exceptions, you know, that prevents -- prevents the railroad from having a perfect trip, if you will.

So automation will take care of a lot of these things, which is, you know, the correct item identification of the department track.

That's a key thing, because lots of times, you know, the operator doesn't know that he's on track one or track two, you know, that that -- so that will be automated, again, because of the train location ability to try to identify that.

So we feel some of these task -- these tasks that could be taken, you know -- not taken away from the operator, but really help the operator in his -- in his procedure to initialize the -- but we definitely have seen with the amount of training and the amount of miles, operators, are logging or having under their belt by now that these failures are dramatically --

Q. Hmm.

A. -- decreasing.

Q. Okay.

A. You know, it's, like any new system, you know, they're, at the beginning, it's -- it's a little tough, you know.

Q. Yeah.

A. But between --

Q. If --

A. -- between increasing the level of automations, as well as the training, we see that quite clear that, you know, the issue is improving quite a bit.

Q. Okay. Thank you. Last one from me. Just open-ended. Do you have any thoughts or are you involved at all with the BNSF,

OMA, the -- the work that they're going to do to, I don't want to step too far, but get into virtual blocks and those kinds of things?

A. We are as part of, you know, of -- because we're members of the AR Committee with BNSF is also a member. So these kinds of technologies are being talked about. Sometimes railroads do some research and some development on their own, but eventually they bring it to -- to the AR Committee and make it available to other railroads.

So we are monitoring that -- that particular development definitely and we're hoping that BNSF will engage their -- the rest of the through -- again, through the AR, the rest of the railroads to provide that technology and integrate it into -- into the network operation.

I mean it's very important for all the railroads to, you know -- not just from an interoperability standpoint, but having some commonality among them in terms of the systems and the -- and the operating and practices that (indiscernible) they do --

Q. Okay.

A. -- conducting their business.

MR. MANUTES: Okay. Rubin, do you -- I'm done. Do you have anything else?

MR. PAYAN: No, no. That was a lot of information. Very, very interesting but you actually used up all my questions.

MR. SCOTT: The --

MR. ALIBRAHIM: And, please, I want to -- I want to pay, you know -- direct your attention to our library. We have an eLibrary, and I can send you the link to it. It's in the -- it's part of the FRA website, and it has reports on all the research, the topics that we talked about and then some, you know, in terms of if you guys want to read up on it and --

MR. PAYAN: Yeah. Absolutely. Yeah. That would help us out.

MR. MANUTES: Okay.

MR. SCOTT: The Interoperability Committee, do they meet, like, quarterly or just as there's an issue or how do they meet?

MR. ALIBRAHAM: I think at least it's quarterly. One of my PMs is a member of that committee and I think at least it's quarterly, if not monthly.

MR. SCOTT: Okay.

MR. ALIBRAHAM: Yeah.

MR. PAYAN: Okay.

MR. MANUTES: Okay?

MR. PAYAN: That's all --

BY MR. MANUTES:

Q. Do you have any other thoughts you want to leave us with, Sam? I mean we'll -- the eLibrary's a good one. Anything you're most excited about that we didn't touch on or anything?

A. We -- just, you know, we're very excited about the -- the shift that we're working on because we're, you know -- fix

blocking has been around for 100 years, you know, and this is -- it's time to move into the moving block train operation.

I think people will -- and now the technology is really solid enough, reliable enough that -- that can make this definitely happen. It's a lot more expensive to lay down another mile of track as opposed to squeezing more capacity out of existing -- existing miles of track.

Q. Yeah.

MR. SCOTT: Yeah.

MR. ALIBRAHIM: So --

BY MR. MANUTES:

Q. Yeah. Definitely. Your excitement is contagious on those, I think, for all of us.

A. Oh, well --

Q. It's very exciting.

A. Like an engineer, you know, you -- you enjoy, you know, seeing the outcome of the -- the design or the development --

Q. Yeah.

A. -- and it's impact on not just economy but on society too.

MR. MANUTES: Yeah. Absolutely. All right. I'm going to end the recording. I'll thank you for your time and end the recording, but then we'll say goodbye after I hit stop here.

MR. ALIBRAHIM: All right.

(Whereupon, the interview was concluded.)

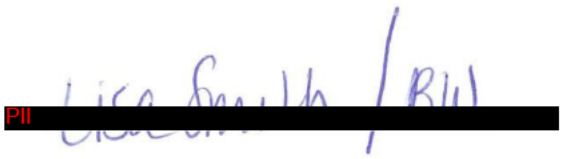
CERTIFICATE

This is to certify that the attached proceeding before the

NATIONAL TRANSPORTATION SAFETY BOARD

IN THE MATTER OF:	BNSF EMPLOYEE FATALITY IN LA MIRADA, CALIFORNIA ON October 6, 2021 Interview of Sam Alibrahim
ACCIDENT NO.:	DCA21SR003
PLACE:	Via Microsoft Teams
DATE:	October 6, 2021

was held according to the record, and that this is the original, complete, true and accurate transcript which has been transcribed to the best of my skill and ability.



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