Ottawa Light Rail Commission

Paul Dooyeweerd
on Friday, May 20, 2022

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OTTAWA LIGHT RAIL COMMISSION

THALES CANADA INC. - PAUL DOOYEWEERD

MAY 20, 2022

--- Held via Zoom Video Conferencing, with all participants attending remotely, on the 20th day of May, 2022, 9:00 a.m. to 11:46 a.m.

COMMISSION COUNSEL:

Christine Mainville, Co-Lead Counsel Member
Tara Boghosian, Litigation Counsel Member

PARTICIPANTS:
Paul Dooyeweerd, Thales Canada Ltd.
Peter Mantas - Fasken
Maria Braker - Fasken

ALSO PRESENT:

Janet Belma, Official Court Reporter
Chris Delic, Virtual Technician

I N D E X

WITNESS: PAUL DOOYEWEERD
Examination by Christine Mainville.....6

The following list of undertakings, advisements and refusals is meant as a guide only for the assistance of counsel and no other purpose

INDEX OF UNDERTAKINGS

The questions/requests undertaken are noted by U/T and appear on the following pages: None

INDEX OF ADVISEMENTS

The questions/requests taken under advisement are noted by U/A and appear on the following pages: None

INDEX OF REFUSALS

The questions/requests refused are noted by R/F and appear on the following pages: None

-- Upon commencing at 9:00 a.m.

CHRISTINE MAINVILLE: So, Mr. Dooyeweerd, the purpose of today's interview is to obtain your evidence under oath or solemn declaration for use at the Commission's Public Hearing. This will be a collaborative interview such that my co-counsel, Ms. Boghosian, may intervene to ask certain questions. If time permits, your counsel may also ask follow-up questions at the end of the interview.

The interview is being transcribed, and the Commission intends to enter the transcript into evidence at the Commission's Public Hearings either at the hearings themselves or by way of procedural order before the hearings commence.

The transcript will be posted to the Commission's public website along with any corrections made to it after it is entered into evidence. And the transcript will be shared with the Commission's participants and their counsel on a confidential basis before being entered into evidence.

You will be given the opportunity to review your transcript and correct any typos or other errors before the transcript is shared with

the participants or entered into evidence. Any non-typographical corrections made will be appended to the transcript.

And Pursuant to Section 33(6) of the Public Inquiries Act, 2009, a witness at an inquiry shall be deemed to have objected to answer any question asked of him upon the ground that his answer may tend to incriminate the witness or may tend to establish his liability to civil proceedings at the instance of the Crown or of any person. And no answer given by a witness at an inquiry shall be used or be receivable in evidence against him in any trial or other proceedings against him thereafter taking place other than a prosecution for perjury in giving such evidence.

And as required by Section 33(7) of the Act, you are advised that you have the right to object to answer any question under Section 5 of the Canada Evidence Act.

Okay. I don't think we have had anyone else join, so, Peter, if you'd be kind enough to swear or affirm the witness.

PETER MANTAS: Thank you, counsel. Can you hear me, Mr. Dooyeweerd?

PAUL DOOYEWEERD: I can.

PETER MANTAS: Mr. Dooyeweerd, do you affirm that the answers that you will give at your examination today will be the truth, the whole truth, and nothing but the truth?

PAUL DOOYEWEERD: I do.

AFFIRMED: PAUL DOOYEWEERD.

PETER MANTAS: Thank you. And just one more point, Mr. Dooyeweerd. If you have a need for a break at some point, we'll take a regular one at some point, but if you do need a break, just let Ms. Mainville know.

PAUL DOOYEWEERD: Okay.

PETER MANTAS: Thank you.

CATHERINE MAINVILLE: Thank you. So if we could start by having you explain your role or involvement in Stage 1 of Ottawa's LRT project.

PAUL DOOYEWEERD: Okay. My role on the project is Project Design Authority. I'm -- the lead technical engineer for the project, primary point of contact for all technical issues with the customer and external subcontractors, mostly responsible for review and approval of all internal designs ensuring that the system meets all requirements.

CATHERINE MAINVILLE: And do I understand that you were involved since the bid phase on this project.

PAUL DOOYEWEERD: Yes, I started probably about a year before the bid was awarded -- the contract was awarded.

CATHERINE MAINVILLE: Sorry. I missed that.

PAUL DOOYEWEERD: About a year before the contract was awarded was when I came on.

CATHERINE MAINVILLE: Okay. And are you still involved.

PAUL DOOYEWEERD: Yes.

CATHERINE MAINVILLE: So you've been there through the life of the project.

PAUL DOOYEWEERD: Correct.

CATHERINE MAINVILLE: And could you tell us a bit about your experience and background. I take it you're an engineer.

PAUL DOOYEWEERD: I am an engineer, yes. I have a degree in electrical engineering from the University of Toronto, spent the first couple of years of my working life at Litton Systems working in various military programs.

Then I moved to a company called Atlantis Aerospace. I was there for 15 years. That was primarily maintenance trainers for military and commercial flight simulators. And then in 2004, I came to Thales into the Systems Engineering Group.

2009, I became what at the time was called a principal system engineer, roughly the equivalent of a Project Design Authority. So I've been in my current role for 13 years.

CATHERINE MAINVILLE: I don't think we have your resume. I just want to confirm that.

PETER MANTAS: Maria, please go ahead. I think you have the answer to that. We --

MARIA BRAKER: Can we go off the record?

(DISCUSSION OFF THE RECORD)

CHRISTINE MAINVILLE: So did you have any involvement in the industry consultations on this project?

PAUL DOOYEWEERD: No.

CATHERINE MAINVILLE: And so about a year before the contract was awarded, what was Thales' involvement in terms of seeking or putting forward any sort of bid in respect of this project.

COURT REPORTER: Ma'am, you're cutting out a bit for me. I'm sorry. At the end, you were trailing off.

CATHERINE MAINVILLE: In terms of putting forward any sort of bid for this project.

PAUL DOOYEWEERD: I can speak to my role during the bid stage. The design authority and the engineering team is largely inwardly focused during the bid stage, very little contact with -- with the customer.

Our goal is to go through the contract, understand the contract, determine which aspects of the requirements are satisfied by our product and which aspects will require the development of -- of new features. We work up estimates for those new features, identify risks, and basically come up with a cost for the system.

CATHERINE MAINVILLE: And can you tell me what you recall of the requirements on this project that were pertinent to Thales.

PAUL DOOYEWEERD: It was primarily -- came from the -- the project agreements. I think it was Schedule 15 Part 4 Article 5.

CATHERINE MAINVILLE: Let me ask you this: Were there any that were -- any requirements

of particular note for Thales in respect of this project.

COURT REPORTER: You cut out at the end again, ma'am. Of particular note for Thales --

CATHERINE MAINVILLE: For Thales in respect of this project.

Is my audio good enough? Should I be --

COURT REPORTER: It is, and then you just trail right off.

PETER MANTAS: Yes. I think what's happening, Christine, is your audio's good, but sometimes, if you're just looking at your other screen just to look at a doc, it just goes silent on you.

CHRISTINE MAINVILLE: I'll try to keep my head up.

PETER MANTAS: The perils of doing an online examination or the challenges, right?

CHRISTINE MAINVILLE: Okay. Do you have my question.

PETER MANTAS: Yes. We hear you well. When you're in this kind of position, you seem fine. Just if you just ask that question again, Christine, because I don't think it came out

clearly.

CHRISTINE MAINVILLE: I think it was about, as far as I recall, whether there were any requirements of particular note that were noteworthy for you or for the team.

PAUL DOOYEWEERD: I would -- I would say no.

CATHERINE MAINVILLE: And you said you will assess what requires the development of new features. Were there any of note on this project.

PAUL DOOYEWEERD: Nothing of note. Every customer has features they want that aren't satisfied by the product, as it is, but there's nothing -- nothing earth-shattering, no.

CATHERINE MAINVILLE: Nothing that you saw or Thales felt entailed significant risk.

PAUL DOOYEWEERD: No.

CATHERINE MAINVILLE: Do you recall that the speed to be met here was a hundred kilometers an hour.

PAUL DOOYEWEERD: My recollection was the -- the maximum speed was to be 90 operating speed.

CATHERINE MAINVILLE: And would that be standard.

PAUL DOOYEWEERD: That's fairly typical, yeah.

CATHERINE MAINVILLE: For an LRT.

PAUL DOOYEWEERD: It's quite standard for heavy metro --

CATHERINE MAINVILLE: Right.

PAUL DOOYEWEERD: -- that similarity as well, yes.

CATHERINE MAINVILLE: You don't know for certain? Or...

PAUL DOOYEWEERD: No.

CATHERINE MAINVILLE: Do you recall the City's need to move a certain number of people per hour and having a fairly high-capacity requirement.

PAUL DOOYEWEERD: I do. We had several discussions about capacity requirements. Signalling is a contributor to capacity requirement. It's -- it's a combination of how many passengers the train can hold, which has nothing to do with signalling, and the frequency at which you can push trains through the system which is to some extent influenced by signalling.

CATHERINE MAINVILLE: And was that, in this particular case, a fairly demanding feature of the requirements? So in terms of the frequency at

which you...

PAUL DOOYEWEERD: No. The -- the way the specification was written, they -- they defined what -- what they call the minimum headway, so that's the -- the minimum interval between trains which is what signalling needs to target. And we didn't see an issue meeting that.

Now, in that there's an assumption that the trains are actually large enough to carry enough passengers that at that frequency you get the required throughput.

So the question of capacity in terms of passengers per hour per direction is really a system integration requirement, and it requires various subsystems to meet their respective requirements to meet the overall capacity requirement.

CATHERINE MAINVILLE: Right. And does it require integration as between those two -- maybe you could explain that a bit. Is it just that it's not only a matter of the signalling system; it's also a matter of the train capacity, or are you saying it's more than that? It also has --

PAUL DOOYEWEERD: It's more than that.

It also comes down to the guideway design. Every curve has a speed limit. Every speed limit is going to introduce constraints on performance. It also depends on the train how -- how well does it accelerate. Deceleration normally isn't an issue, but acceleration can certainly impact the interval between trains.

It's also a function of how -- how strong the emergency brakes are on the train. The stronger the emergency brakes are, the closer you can run trains and not risk collision, so there are a number of factors that -- that work into it.

CATHERINE MAINVILLE: Right. So maybe we could just deal with this aspect of the project first. Over the course of the design and build and start of operations, were there challenges on this front in terms of that integration.

PAUL DOOYEWEERD: I think the only challenges that we had really centred around getting speed limit data for the -- the track and also getting performance data for the trains.

CATHERINE MAINVILLE: And so to start with the first one, the -- the speed limit data, who would that -- who would be providing you with that data.

PAUL DOOYEWEERD: Well, all of the data that we got came from ORLTC constructors. They would have got it from their track designer.

CATHERINE MAINVILLE: So that one at base, would have been provided to ORLTC by the engineering joint venture, RTGJV, if you're aware.

PAUL DOOYEWEERD: If -- if they were the track designers. I'm not sure who the track designers were.

CATHERINE MAINVILLE: And the performance data, would that originate from Alstom.

PAUL DOOYEWEERD: Yes.

CATHERINE MAINVILLE: And you said all of that information flowed through ORLTC. Do you know why there were challenges in providing that data to Thales.

PAUL DOOYEWEERD: I -- I recall it took a little while to get finalized track data, and speed limit data had changed a few times. And then with the train, I think the -- the one issue that took a while to resolve was what the emergency brake rate was, what we call the guaranteed emergency brake rate.

And it was with respect to single LRVs. The coupled LRV was -- was never really an issue.

But the single LRV, the guaranteed emergency brake rate was too low to -- for us to be able to meet the -- the headway requirements.

CATHERINE MAINVILLE: So maybe you can explain what that means in terms of the -- how that works, the emergency brake rate and how it impacts the headway requirements.

PAUL DOOYEWEERD: Okay. Well, the headway is a measure of how -- how much space there is between trains. If you want a lower headway, your trains have to run close together.

What the signalling system needs to do is account for a situation where you have what we call a worse-case run away propulsion failure. It's where you have an empty train, and all of a sudden, full thrust is applied. Some failure causes it to run away.

When we detect that condition, the signalling system has to vitally disable the propulsion on the train, vitally command the emergency brakes to apply. And then once the emergency brakes kick in, there's a certain guaranteed deceleration rate that we will get. And from that, you can figure out how much distance is required to stop the train.

So your minimum separation between trains has to be greater than that calculated distance.

CATHERINE MAINVILLE: Right.

PAUL DOOYEWEERD: So the -- the lower the deceleration rate of the train, the bigger the gap needs -- needs to be between trains to ensure safety.

CATHERINE MAINVILLE: Right. And am I right that the -- the way that ultimately what Thales produced to meet the requirements was a fairly -- I shouldn't use the word aggressive -- -- but strong acceleration rate and deceleration rate but little, if any, coasting in between? Is that like splitting the (INDISCERNIBLE) --

PAUL DOOYEWEERD: Yeah. No, we -- we don't typically coast. You accelerate up to whatever the -- the track speed is, and -- and, you know, if you're approaching a curve that has a reduced speed, you have to break into the curve, get down to the -- the curve speed, but we're always trying to run the trains at the maximum speed attainable, and that's how you get your best performance.

CATHERINE MAINVILLE: Okay. So that's

typical for all --

PAUL DOOYEWEERD: M-hm.

COURT REPORTER: I missed the end of that, ma'am.

CATHERINE MAINVILLE: That's typical for all projects. And you said yes.

PAUL DOOYEWEERD: Yes.

CATHERINE MAINVILLE: So you don't -- so you break into a curve, and you don't typically provide coasting on Thales' signalling tests.

PAUL DOOYEWEERD: There is a coasting feature which can be enabled, but it needs to be understood that when you do that, your trip times increase. Your capacity decreases. You can't get as many passengers through the system. That is an option that we provide as part of our product.

CATHERINE MAINVILLE: And does that lead to more emergency braking as well, that --

PAUL DOOYEWEERD: No. No.

CATHERINE MAINVILLE: Does there need to be some change in the speed profiles based on inclement weather or wet rail.

PAUL DOOYEWEERD: We do have a feature where you can reduce the acceleration and braking rates. It's operator selectable in inclement

weather. Yes, they can -- they can reduce those rates.

CATHERINE MAINVILLE: And that's -- am I right that that is a setting as opposed to something the train operator would do?

PAUL DOOYEWEERD: The central operator would do that.

CATHERINE MAINVILLE: And I take it that's specified somewhere --

PAUL DOOYEWEERD: No. No, it's not. It's a feature of our system. There's nothing specified.

CATHERINE MAINVILLE: What I mean is, is it written down somewhere?

PAUL DOOYEWEERD: Oh, yeah. It would be described in our -- in our design documentation.

CATHERINE MAINVILLE: Which would be provided to -- would it be provided to the operator.

PAUL DOOYEWEERD: Yes. The operators would have the user manuals, and there is a description of that feature in there.

CATHERINE MAINVILLE: Okay. Am I right that the -- under the contract, there was a guaranteed speed or travel time for the different

trips.

PAUL DOOYEWEERD: Yes. There was an end-to-end travel time specified.

CATHERINE MAINVILLE: And that -- that was not dependent on weather.

PAUL DOOYEWEERD: No.

CATHERINE MAINVILLE: And why wouldn't the contract provide for different guaranteed travel time depending on inclement weather.

PAUL DOOYEWEERD: You would have to ask the City.

CATHERINE MAINVILLE: Well, would that make sense to you that it should be lowered --

PAUL DOOYEWEERD: I've -- I've honestly not typically seen that. They -- they typically just specify an end-to-end trip time assuming a sunny day, best case.

CATHERINE MAINVILLE: But typically, you'd agree that trains should be travelling slower to some extent depending...

PAUL DOOYEWEERD: I think it really depends on the train. Some -- some trains are less likely to lose adhesion in inclement weather than -- than others.

LRVs are relatively lightweight, so I

would expect that they would lose traction a little more easily.

CATHERINE MAINVILLE: And what about in the winter? Does it need to travel at a different speed to some extent.

PAUL DOOYEWEERD: Again, that's -- that's really a question for the rolling stock supplier. With our system, you can reduce the acceleration of braking rates if the adhesion is poor.

CATHERINE MAINVILLE: But the -- am I right that the guaranteed travel time under the contract, is it a requirement that Thales has to meet or both.

PAUL DOOYEWEERD: No. That -- a requirement like that is really a requirement the system integrator needs to meet because the travel time is -- is dependent on how well the train accelerates, what the speed limits are on the guideway, how the signalling system controls the train, how well the train brakes. The -- it's an -- it's an integrated responsibility. Signalling's part of it. The rolling stock's part of it, and the track is part of it.

CATHERINE MAINVILLE: So what level of

planning needs to take place for -- you know, early on to know whether you're able to meet -- whether the -- so that the integrator knows whether it's able to meet these requirements.

PAUL DOOYEWEERD: Well, ideally, the system integrator would -- would sit down and -- and take that high-level requirement and break it down at the lower-level requirements. And you'd have a set of requirements for the track designer, a set of requirements for the rolling stock supplier, a set of requirements for the signalling supplier. And if all of those subcontractors meet those particular requirements when you bring them all together, you meet your end-to-end trip time.

CATHERINE MAINVILLE: Do you know if this happened in this case.

PAUL DOOYEWEERD: I don't believe it did.

CATHERINE MAINVILLE: And so can we talk about that a bit, the systems integration on the project. Did you perceive -- you know, Thales, perceive gaps in that respect.

PAUL DOOYEWEERD: Sorry. Could you repeat the question.

CATHERINE MAINVILLE: Yes. In terms of

the systems integration on the project, maybe you can speak to your views about how that proceeded and if you saw that -- you or Thales perceived gaps.

PAUL DOOYEWEERD: I would have to say relative to other projects I worked on, yes, there -- there were certainly gaps.

CATHERINE MAINVILLE: Can you give me some sense of that or examples of where you would have expected to be more focused on integration perhaps and --

PAUL DOOYEWEERD: Yeah.

COURT REPORTER: Ma'am, you just completely lost me at the end. To be more focus --

CATHERINE MAINVILLE: More focused where you would have expected more focus on integration and --

PAUL DOOYEWEERD: Yeah. I think earlier on in the project, one of the -- the key roles of -- of a system integrator is -- is to really specify in more detail requirements particular to each subcontractor.

If you look at the project agreement, there's a lot of high-level requirements about what the overall integrated system is supposed to do.

And in order to meet those requirements, each of the subcontractors have to meet lower-level requirements that, when you pull all of them together and put all the subsystems together, you meet the higher-level requirement. And it -- there didn't seem to be lot of that happening.

I know early -- early in the project when we first started and we started to have meetings with Alstom, as that is one of our primary interfaces, the only attendee from ORLTC was a contract manager, so there was no technical presence at all.

CATHERINE MAINVILLE: Did you understand why that was.

PAUL DOOYEWEERD: No.

CATHERINE MAINVILLE: Let me ask you this: Did you or Alstom ask about bringing in someone else or where the technical person was.

PAUL DOOYEWEERD: I -- it was a long time ago. I don't recall specifically, but I do recall that they recognized the -- the need, and they did hire shortly after.

CATHERINE MAINVILLE: And is that when Mr. Bergeron came in.

PAUL DOOYEWEERD: Mr. Bergeron was a

little bit later. I don't recall when he came in.

CATHERINE MAINVILLE: It would have been in 2014.

PAUL DOOYEWEERD: Early 2014, I think, yes.

CATHERINE MAINVILLE: So there was someone before him.

PAUL DOOYEWEERD: They did hire a couple of people, yes.

CATHERINE MAINVILLE: And did that solve the issue, or were there still some gaps.

PAUL DOOYEWEERD: I would say, no, it did not, didn't really resolve the issue.

CATHERINE MAINVILLE: And why is that.

PAUL DOOYEWEERD: Not enough experience, and if you're going to be system integrator, you better have a lot of experience.

CATHERINE MAINVILLE: And I take it you're speaking of integration not only at the rolling stock and signalling system level but more broadly.

PAUL DOOYEWEERD: Correct.

CATHERINE MAINVILLE: And was there a gap also on the rolling stock and signalling system integration.

PAUL DOOYEWEERD: I would have to say it did not go as smoothly as I had seen it go on other projects.

CATHERINE MAINVILLE: Is that primarily by virtue of the fact that there wasn't a technical systems integrator at least early on in the project or someone with sufficient experience overseeing it.

PAUL DOOYEWEERD: Well, I think -- I think Jacques Bergeron was certainly experienced enough to oversee it. I -- I think the -- in retrospect, the challenge was that we did not understand everything that we needed to know about the trains.

So once we put the system together and started running trains, we discovered things that were unknown. And it's -- it's important for the system integrator to review the designs submitted by the rolling stock suppliers, review the designs submitted by the signalling supplier, and ensure that the rolling stock supplier is aware of anything particular to the signalling design that they would need to know and vice versa.

And in order to do that, you -- you have to really understand how the two systems are

supposed to interact.

CATHERINE MAINVILLE: And the train started running -- like, when would you say you started noticing these issues after the train started running? Is this 2018 or before.

PAUL DOOYEWEERD: I -- I couldn't put a date on it.

CATHERINE MAINVILLE: Wasn't it -- let me ask you it this way: Do you know whether Mr. Bergeron was still on the file.

PAUL DOOYEWEERD: I believe he was, yeah.

CATHERINE MAINVILLE: And given that he had to your understanding the level of experience required, what explains that that didn't fully happen, this integration between the signalling system --

COURT REPORTER: Sorry. This integration?

CATHERINE MAINVILLE: Why it didn't fully happen before the train started running. I may have said the integration between the rolling stock and the system.

PAUL DOOYEWEERD: All I can give is an opinion. I think that there were too many issues

for one person to handle.

CATHERINE MAINVILLE: So not enough resources or focus on integration --

PAUL DOOYEWEERD: Correct.

CATHERINE MAINVILLE: -- by ORLTC. Sorry. You have to say it for the record instead of nodding. Yes.

PAUL DOOYEWEERD: Yes.

CATHERINE MAINVILLE: And then in terms of -- well, let's continue on this point for a minute. There were issues observed, integration issues observed when the train started running.

Did those continue on through 2109? I take it you would identify an issue, resolve it, but there may have been other issues that would arise? Is that fair to say?

PAUL DOOYEWEERD: Yeah, it's not unusual. You're going to run into issues certainly. There were -- there were a series of -- of issues.

CATHERINE MAINVILLE: Could you give me some example of the kind of issue that relates to insufficient integration between the rolling stock and the signalling system that arose.

PAUL DOOYEWEERD: I think the -- the

biggest one I -- I recall was something that hit right when we went to revenue service. Our onboard controller, which we call the VOBC, was periodically reporting that it had lost communications with the rolling stock TCMS which is the main brain for the train.

So what was happening was the -- the TCMS was -- as I understand it, it was halting, and the train would become disabled.

CATHERINE MAINVILLE: And what is the TCMS --

PAUL DOOYEWEERD: I believe it's Train Control and Management System. I'm not sure. It's an Alstom system, but it's their main computer.

CATHERINE MAINVILLE: Software.

PAUL DOOYEWEERD: Yeah.

CATHERINE MAINVILLE: Alstom software. And it was -- it would lose communication with --

PAUL DOOYEWEERD: With our system.

CATHERINE MAINVILLE: And so the trains then just stopped running.

PAUL DOOYEWEERD: Yeah. They wouldn't -- they wouldn't operate.

CATHERINE MAINVILLE: And how long does it take to fix that on a particular train when it

happens.

PAUL DOOYEWEERD: I -- I don't know. They -- they would have to reset their -- their system.

CATHERINE MAINVILLE: And so you said that arose right when it went into revenue service. Do you mean service operations with the public.

PAUL DOOYEWEERD: Yes. In September 2019.

CATHERINE MAINVILLE: So that arose in September. Do you know how long it took to fix that, or was there a permanent fix to it.

PAUL DOOYEWEERD: There was a permanent fix. I -- I don't recall when it was permanently fixed.

CATHERINE MAINVILLE: And do you recall any later issues during service, later breakdowns, or other problems that the trains were experiencing that relate to an integration issue.

PAUL DOOYEWEERD: The only -- I'm sure there were a few. The -- another one I remember was if -- if the signalling applies the emergency brake for whatever reason, the train will stop. If we determine that the condition that led to the emergency brake application is no longer -- no

longer exists, we will release the emergency brakes and then command the train to move.

And what we found at some times is the train just wouldn't move. So it turned out that in some conditions, it could take up to six seconds for the emergency brakes to be reset -- and how do I put this? There -- there are conditions where we would have to wait up to six seconds after releasing emergency brakes before trying to move the train.

That was not always the case, but sometimes that is the case. So we -- we had to modify our software to wait an additional six seconds after the release of EB before we try and move the train.

CATHERINE MAINVILLE: And so how did that manifest itself, let's say, from (INDISCERNIBLE) to the trains would be --

COURT REPORTER: I'm sorry, ma'am. That's hard to understand what you're saying. I wonder if the other ladies could actually mute their videos. Just, it might help. I don't know.

Sometimes, you just trail off at the end, and it's very difficult.

CATHERINE MAINVILLE: It must be WebEx.

COURT REPORTER: Yes, WebEX is different than Zoom, and it's just you, and I'm not sure why. The witness is fine. Sorry. I'm very sorry.

CATHERINE MAINVILLE: And so, yes, I was asking how that manifests itself if it would be a train that stalls for some period of time.

PAUL DOOYEWEERD: Sorry. Could you repeat that last part.

CATHERINE MAINVILLE: If -- if it would be like a stalled train for some period of time. Is that how a passenger might experience it, for instance, some delay or...

PAUL DOOYEWEERD: It would be a delay. It would be a relatively short delay. What would happen is we would try and move the train, and signalling has a supervision in it. If we command a train to move and the train fails to move 1 meter in nine seconds, we will emergency brake the train and drop an alarm for a -- what we call an motion obstruction, so it introduces a bit of a delay, but it's not -- I wouldn't say it's something passengers would necessarily notice. It's a few seconds.

CATHERINE MAINVILLE: Do you happen to

know in terms of well -- sorry. Did this one engage the reset? Did the system have to be reset? Or --

PAUL DOOYEWEERD: No. No. No. No.

CATHERINE MAINVILLE: It would just, then, start, correct.

PAUL DOOYEWEERD: Correct.

CATHERINE MAINVILLE: What about the door issues that were experienced after revenue service? Would that have anything to do with Thales' system.

PAUL DOOYEWEERD: You mean the doors jamming? That -- that had nothing to do with us, no.

CATHERINE MAINVILLE: Or an integration issue.

PAUL DOOYEWEERD: No.

CATHERINE MAINVILLE: And do you recall your vision issues when -- I think perhaps around the trial running shortly before revenue service there were issues with -- involving the CCTV and -- and the rear vision. Is it -- would that have come to your attention.

PAUL DOOYEWEERD: No. That's not a -- not a signalling issue.

CATHERINE MAINVILLE: Now, maybe if we go back to the broader integration issue, so the guideway and the infrastructure, were there -- well, let's start with the gaps there.

Could you have expected the same systems integrator to be in charge of that integration and the rolling stock integration? In other words, is it two different roles, someone looking after the rolling stock and signalling system integration and someone looking at the broader integration on the project, or would it normally be all overseen by the same people --

PAUL DOOYEWEERD: Sorry. I'm not sure I understand the question.

CATHERINE MAINVILLE: So my understanding is there's quite a bit of work to be put into the integration between the rolling stock and the signalling system. Is that fair to say.

PAUL DOOYEWEERD: That's fair to say.

CATHERINE MAINVILLE: So normally, is that -- is there a systems integrator, one or more persons in that role, but looking after that aspect of the project, and a systems integrator looking at the broader integration? Or are all these people supposed to be working together.

PAUL DOOYEWEERD: Well, the system integrator should be working on the entire system. Now, you may have people assigned specifically to manage the interface between signalling and the rolling stock or signalling and the passenger information display. It really depends how the system integrator wants to arrange themselves.

But ultimately, they are responsible for making sure that all of the subsystems come together and work as an integrated system to meet the end requirements.

CATHERINE MAINVILLE: And we discussed how you would attend meetings with Alstom and to work on the integration with the rolling stock. When I say you, I mean Thales would attend.

And eventually, Mr. Bergeron came on, and am I right that he was mostly focused on the rolling stock integration?

PAUL DOOYEWEERD: Correct. I think he was actually maybe more focused on the rolling stock itself.

CATHERINE MAINVILLE: Okay. So not --

PAUL DOOYEWEERD: He -- he did look at signalling as well.

CATHERINE MAINVILLE: So on making the

trains ready.

PAUL DOOYEWEERD: Correct. Because the train itself, if you put signalling aside, the train itself has a number of subsystems all provided by subcontractors that Alstom would get components from, and those all need to be integrated. So that integration would be done by Alstom, but it would be overseen by the higher-level system integrator.

CATHERINE MAINVILLE: So even during his time there, there were gaps in terms of looking at integrating the signalling system with the rolling stock.

PAUL DOOYEWEERD: Yeah. I would -- I would have to say there were some gaps, yeah. And it's not unusual. You are going to discover things after you put things together. I think it's -- what is a little bit unusual is you find things after you've gone to revenue service.

CATHERINE MAINVILLE: And in terms of just sticking for a moment with the broader integration, then, was there anyone in that role given that I take it Mr. Bergeron was mostly looking at rolling stock -- was there anyone or did you -- who did you engage with on the integration

with the infrastructure, the guideways, and broader integration issues, if any.

PAUL DOOYEWEERD: That was pretty much all Mr. Bergeron.

CATHERINE MAINVILLE: And so did that gap, as I understand your evidence to be, that there wasn't sufficient attention to this broader integration, correct -- to the overall integration of the various systems.

PAUL DOOYEWEERD: I would say that's my -- my impression.

CATHERINE MAINVILLE: Okay. Well, did this manifest itself in any way? Did this have implications? You know, you spoke about the implications, some examples of integration issues with the rolling stock.

In terms of broader integration, issues, did that manifest itself in any way in the course of the project?

PAUL DOOYEWEERD: I think it generally just took us longer to get to the end. Yeah, we -- we didn't have a lot of other systems to integrate with. Rolling stock is the big one. We also had to integrate with the SCADA system and the -- the wayside passenger information system. Those are

relatively simple interfaces. That was supplied by a company that we have worked with before, so we know how each other works. We -- we used a protocol that we're both familiar with.

CATHERINE MAINVILLE: Which company was that?

PAUL DOOYEWEERD: Willowglen.

CATHERINE MAINVILLE: And you mentioned earlier that there were challenges getting the speed limit data for the track from the track design.

PAUL DOOYEWEERD: Well, I think it took a while to get finalized data. It -- it changed.

CATHERINE MAINVILLE: And --

PAUL DOOYEWEERD: And also, I think just getting the integrator to understand what it is we really needed. What we need is the -- the speed at -- the absolute speed limit for the track, the maximum safe speed, and then we will back off the operating speed a certain margin below that to ensure that no matter what happens, you never exceed that maximum safe speed.

CATHERINE MAINVILLE: In terms of your comment about it being unusual that these issues would manifest themselves after revenue service,

could you speak to, aside from the issues we've already discussed, what may have enabled this to occur? For instance, you know, was the testing and commissioning phase sufficient? Was there sufficient dynamic testing, and so forth.

PAUL DOOYEWEERD: That -- that's something that -- it's difficult to answer because I don't really know when the problem introduced itself. We did not see it during our testing. Whether or not it was seen during trial operations, I -- I'm not too sure.

CATHERINE MAINVILLE: So let's start with this: What was your involvement, if any, during testing? Let's start with the testing and commissioning.

PAUL DOOYEWEERD: Well, testing and commissioning, we have a set of requirements that are derived from the customer requirements, and our testing program centres around ensuring that every one of those requirements is satisfied.

CATHERINE MAINVILLE: Correct.

PAUL DOOYEWEERD: So it's very signalling-centric. We do test interfaces but not end to end. We're just making sure that our interfaces at our boundary work the way we expect

them to.

The one exception to that is the rolling stock because we are controlling the train. We do need to run the train and ensure that we're controlling the propulsion and braking systems properly.

CATHERINE MAINVILLE: Would those interfaces, additional interfaces, not be tested during the systems -- or the -- the integration tests?

PAUL DOOYEWEERD: Yeah. Normally, the system integrator would -- would run tests with the integrated system to ensure that the integrated system is meeting its requirements, yes.

CATHERINE MAINVILLE: And do you have knowledge of that testing.

PAUL DOOYEWEERD: I do not.

CATHERINE MAINVILLE: In the sense that you were not involved, or --

PAUL DOOYEWEERD: Not involved.

CATHERINE MAINVILLE: Would Thales normally be involved?

COURT REPORTER: Pardon me, ma'am?

CATHERINE MAINVILLE: Would -- well, let me rephrase. Not involved personally, or was

Thales not involved?

PAUL DOOYEWEERD: I don't think Thales was really involved, and typically we're not -- what will happen is if the system integrator runs into an issue during their testing, they'll figure out where the problem lies. And if they find a problem with signalling, they will come to the signalling supplier, say we've detected this problem, and we will resolve it.

CATHERINE MAINVILLE: And are you aware of how much integration testing was done, how much you --

PAUL DOOYEWEERD: No, I'm not.

CATHERINE MAINVILLE: Are you aware of the -- I take it ORLTC was responsible for that testing.

PAUL DOOYEWEERD: I'm not entirely certain. The system integrator would -- would be responsible for that testing. I -- I'm not sure if that was ORLTC or if they had a contractor responsible for it.

CATHERINE MAINVILLE: Did the system integrator, whoever it was, come back to Thales with signalling system issues during that phase? Do you know.

PAUL DOOYEWEERD: Not to my knowledge, no.

CATHERINE MAINVILLE: Would you have had any knowledge of trial running.

PAUL DOOYEWEERD: We were aware it occurred, yes.

CATHERINE MAINVILLE: Were you -- and I understand Thales was not formally involved in it, yes? Is that correct that it --

PAUL DOOYEWEERD: Right. Right.

CATHERINE MAINVILLE: So, but did you have any sense of how the trains were performing during that period.

PAUL DOOYEWEERD: I -- I did not, but there may be others in Thales that did, but not -- not myself, no.

CATHERINE MAINVILLE: And was Thales to your knowledge approached about issues during the trial running phase.

PAUL DOOYEWEERD: Not to my knowledge, no, or not my -- not to my recollection.

CATHERINE MAINVILLE: Was Thales consulted at all, and did it have any input into whether the system was ready for revenue service.

PAUL DOOYEWEERD: That's a -- it's a

difficult question to answer. I mean, we were certainly asked if the system is safe, and the answer to that was yes. I -- I don't recall specifically if we were asked for operational readiness.

CATHERINE MAINVILLE: In your role, did you have a view as to how much dry running or burden a new system like this should have to sort of test the reliability of the system, its performance prior to operations.

PAUL DOOYEWEERD: Yes. The time required really does come down to how well the system has been integrated. If -- if the integration has been managed well, it doesn't take a lot of time to get through that integrated testing, but it's hard to put a number on it.

CATHERINE MAINVILLE: Was there a sense -- well, approaching RSA, revenue service, what was the parties' understanding, if you're able to speak to that, of how well integration had gone and the level of integration that had been done.

PAUL DOOYEWEERD: I -- I can't really speak to that.

CATHERINE MAINVILLE: But let me phrase it differently. From Thales' perspective, did -- I

mean, you understood that there had been challenges along the way. Were there concerns that the system was perhaps not as fully integrated as ideally it would be.

PAUL DOOYEWEERD: Nothing specific. I think we would have liked to have had more testing with train control just to ensure that we're -- we're stopping accurately and -- and we've got a comfortable braking, and that can take a little while. But I don't think we had any specific concerns.

CATHERINE MAINVILLE: And the train control testing, is that Thales -- that Thales testing, or is that part of the integration system.

PAUL DOOYEWEERD: No. That is something we have to do. It's -- it requires too much low-level knowledge for an integrator to be able to do it.

CATHERINE MAINVILLE: So it was done, and, you know, the system passed, I take it? But --

PAUL DOOYEWEERD: M-hm.

CATHERINE MAINVILLE: -- ideally, you would do more of it if you had the time.

COURT REPORTER: I missed that, ma'am.

Ideally, you would --

CATHERINE MAINVILLE: Do more of it if you had the time?

PAUL DOOYEWEERD: Yeah, more time is always better. The more time you spend with it, the better your -- your -- the more accurate your control of the train is.

CATHERINE MAINVILLE: And would that have been conveyed in any way to ORLTC, or systems --

PAUL DOOYEWEERD: I believe it was, but when we went to revenue service, the -- our primary -- primary concern operationally is station-stopping accuracy. You don't want to be overshooting or undershooting. The performance was acceptable when we went to revenue service.

CATHERINE MAINVILLE: And was there ever any input provided by Thales to ORLTC about whether there should be more dry running time or burden time before returning to revenue service in this case.

PAUL DOOYEWEERD: I -- I don't recall.

CATHERINE MAINVILLE: Was that Thales' view to say that if it had -- let's say if it had been asked, is that what Thales' view would have

been that there is -- ideally you would have more.

PAUL DOOYEWEERD: I think we would have preferred a little bit more time, yes, but I -- my sense was we didn't really have an option.

CATHERINE MAINVILLE: Right. And what was your understanding in that regard in terms of the timeliness or desire to get to revenue service? Did you have a sense of that from where you stood.

PAUL DOOYEWEERD: From a technical position, no, I -- not really.

CATHERINE MAINVILLE: But you as you've indicated, you understood that if there was more time -- that there was no more -- no additional time available for Thales to run -- to run the --

PAUL DOOYEWEERD: Yeah, my understanding was the date was set, and, you know...

CATHERINE MAINVILLE: Are you able to speak to dynamic winter testing and whether there -- whether there was any.

PAUL DOOYEWEERD: Yeah. I -- I don't recall getting a lot of winter testing. I -- I remember early on when we started running trains, we were having a lot of problems with switches freezing, and there was insufficient heat being

provided to the -- the switch blades to -- to prevent ice from forming.

So I don't recall that we really did get a lot of winter testing in, but winter testing doesn't -- you know, it doesn't really affect signalling all that much. It's more an issue of the track and -- and the rolling stock. They're -- they're more affected by adverse weather.

CATHERINE MAINVILLE: Was there any impact for Thales of not getting access to the sole line and access to the tunnel until fairly late in the day.

COURT REPORTER: Until fairly late -- sorry, ma'am. It did cut out.

CATHERINE MAINVILLE: Fairly late in the day.

COURT REPORTER: I still missed it.

CATHERINE MAINVILLE: Fairly late in the day?

PAUL DOOYEWEERD: Other than schedule slip no, not really. The problem always was that we were chasing a revenue date that kept moving for other -- you know, various reasons.

CATHERINE MAINVILLE: Why was that a problem from your perspective.

PAUL DOOYEWEERD: Very difficult to plan.

CATHERINE MAINVILLE: Maybe you could explain that a bit more because from Thales' perspective, wouldn't you just be -- I mean, you need a certain amount of time to complete your task. Eventually the system has passed on, so how does that impact...

PAUL DOOYEWEERD: Yeah, I mean, we typically commission these things in segments, but it's important to know, you know, when you're getting which segment so you can plan, have the resources available.

But if those -- if those dates keep moving, your plan keeps changing. It's just very difficult to manage your commissioning program when -- when things are moving around so much.

CATHERINE MAINVILLE: There was about a two-week period after trial running -- well, after revenue service was met and before the trains went into operation. Would you have been aware of how the trains were performing during that time.

PAUL DOOYEWEERD: Not that I recall, no.

CATHERINE MAINVILLE: This may relate

to the issue we discussed earlier. Do you recall an issue with a lot of emergency braking during the early phase of operation.

PAUL DOOYEWEERD: Vaguely, yes.

CATHERINE MAINVILLE: Do you know what the cause of that was.

PAUL DOOYEWEERD: Not offhand. I would have to go back and look.

CATHERINE MAINVILLE: Do you recall any concern about the system operating at too high a speed.

PAUL DOOYEWEERD: No.

CATHERINE MAINVILLE: You don't think that was an issue, or you don't recall that.

PAUL DOOYEWEERD: In terms of exceeding guideway speed limits, no, but we also, when trains are braking, we calculate a braking curve that the train has to follow. And if the train is unable to decelerate at the required rate, that by definition becomes on overspeed because you've gone past the braking curve, and you'll apply the EBs.

CATHERINE MAINVILLE: Right. And what might cause the train to not decelerate.

PAUL DOOYEWEERD: Very often lack of adhesion --

CATHERINE MAINVILLE: Right.

PAUL DOOYEWEERD: -- is the issue.

CATHERINE MAINVILLE: And how could that be addressed, this lack of adhesion?

PAUL DOOYEWEERD: Well, the only thing the operators could do with signalling is to reduce the acceleration and braking rates. So if you accelerate less hard and brake less hard, you're less likely to reduce adhesion and slide on the rails.

CATHERINE MAINVILLE: And I take it for that, you would have to change the speed profile and the set -- sorry -- the setting.

PAUL DOOYEWEERD: Yeah. It's -- it's a setting. It doesn't change the speed profiles. It just -- like, service braking on the system is -- is .89 metres per second squared. They can adjust it down to .4 metres per second squared, so it's very gentle braking. So if you are having issues with the wheel-rail adhesion, by decreasing your braking forces, you lessen the risk of sliding.

CATHERINE MAINVILLE: So am I right that because it's an automated train control system, the operator, an individual train operator couldn't just decelerate? That --

PAUL DOOYEWEERD: Well, they -- normally when they run in automated mode, the VOBC is driving the trains, not the driver.

CATHERINE MAINVILLE: Right.

PAUL DOOYEWEERD: So the central operator would -- can pick a section of guideway and say there's an adhesion issue here; I'm going to run reduced acceleration and braking in this section, and every train will reduce its acceleration and braking in that section.

CATHERINE MAINVILLE: Right. So on any given day or even on any given period of time, you know, let's say in the morning, there seems to be less rail adhesion, or -- and -- and there should be a deceleration, that's something that control could do at any given time. Is that fair to say.

PAUL DOOYEWEERD: Yeah, the controller can do that anytime they want, yes.

CATHERINE MAINVILLE: And if that's not done, is it fair to say that the only thing the operator can do is put on the emergency brake.

PAUL DOOYEWEERD: No. The other thing they could do is switch to mode of operation that we call ATPM, Automated Train Protection Manual, where the -- the signalling system is supervising

the train speed, but the driver is controlling the thrust and the braking.

CATHERINE MAINVILLE: But is the emergency brake an option as well to help decelerate or stop?

PAUL DOOYEWEERD: No. The emergency brake is not something you should be using for operational reasons. The emergency brake is there to stop the train because it's going too fast, or it's not braking the way it should, and it's running the risk of over running its track reservation.

CATHERINE MAINVILLE: And while it shouldn't be done, is it fair to say it could be done by the operator.

PAUL DOOYEWEERD: My understanding is the rolling stock provides the option to manually apply the emergency brake. It's nothing to do with signalling.

CATHERINE MAINVILLE: No. I understand. I just want to understand.

PAUL DOOYEWEERD: They take -- yes, they can apply the emergency brakes.

CATHERINE MAINVILLE: Do you have any knowledge of that happening here that operators

were putting on emergency brakes maybe when they shouldn't have when they should have changed the setting.

PAUL DOOYEWEERD: I -- I don't know.

CATHERINE MAINVILLE: Are you aware of wheel-slide issues.

PAUL DOOYEWEERD: I was aware of some during station stops. Yes. They were overshooting due to poor adhesion.

CATHERINE MAINVILLE: Well -- and so was that connected, to, you know, unnecessary or over -- overly applying the emergency brake.

PAUL DOOYEWEERD: No. No. No. The emergency brake is -- is a last resort. It's -- it's not used operationally to stop trains.

CATHERINE MAINVILLE: I understand that, but you don't know whether it was, in fact, even though it is a last resort, whether it wasn't used as a -- (INDISCERNIBLE) you don't -- you're not aware.

PAUL DOOYEWEERD: Sorry I didn't --

COURT REPORTER: It was used as what? Sorry?

CATHERINE MAINVILLE: As a last resort? Even though it's supposed to be -- my question is,

even if it's supposed to be a last resort, you wouldn't have any awareness of whether that's, in fact, how it was used? Is that fair to say.

PAUL DOOYEWEERD: No. No, we wouldn't.

CATHERINE MAINVILLE: So do you have any understanding of what may have led to the wheel flats other than the rail adhesion, like, more specifically.

PAUL DOOYEWEERD: No. It's just -- just rail adhesion.

CATHERINE MAINVILLE: In terms of winter testing, is there anything, from a signalling system perspective, that Thales deems advisable or that's particularly relevant to the signalling system.

PAUL DOOYEWEERD: Specifically, no, not for signalling. It's a good idea to test in all seasons just so you see the gamut of wheel-rail adhesion conditions.

And I believe there is a requirement in the PA, or the Project Agreement, to -- to do testing in all -- all conditions. But in order to do that, you have to have your testing program run over a full year.

CATHERINE MAINVILLE: Would you say, at

this point in the system's life, given that it's been running for a while now, that you would expect all integration issues to have been resolved in terms of, you know, the issues that arose early on that hadn't been -- that were kind of a surprise, or at this point, would you expect any such issue to have arisen.

PAUL DOOYEWEERD: Sorry. You tailed off at the end.

CATHERINE MAINVILLE: Would you expect any such issues to have arisen by now? Like, you wouldn't expect further surprise because of how much the train has run up to now.

PAUL DOOYEWEERD: At this point on the main line, no, I would not -- I would not expect anything new.

CATHERINE MAINVILLE: So there would be -- in other words, there would be no value in sort of going back and retrospectively at this juncture trying to ascertain, you know, whether there is a full integration of the system? You wouldn't retroactively at this point.

PAUL DOOYEWEERD: No. I think after two-and-a-half years of revenue service running many trains every day, I think you've seen

everything you're going to see.

CATHERINE MAINVILLE: I think I'm going to go back to the procurement. So if we want to break now, that might be a good time if we want to take 15 minutes, and then hopefully, I can be quick enough.

PETER MANTAS: Yes. Sure, that's no problem. Should we go off the record?

CHRISTINE MAINVILLE: Go off record.

(DISCUSSION OFF THE RECORD)

(ADJOURNMENT)

CHRISTINE MAINVILLE: Mr. Dooyeweerd, the extent of your involvement in the procurement, do I understand that it didn't relate to any of the commercial aspects?

PAUL DOOYEWEERD: No. Other than working up the cost for the system, no.

CATHERINE MAINVILLE: Okay. So would you have had any particular involvement in meeting with the consortiums.

PAUL DOOYEWEERD: I did attend a few meetings, but typically, that's just to be a fly on the wall just in case something comes up, but I don't recall anything of -- of note being discussed at that point.

CATHERINE MAINVILLE: And I understand Thales presented a bid to more than one consortium.

PAUL DOOYEWEERD: Correct.

CATHERINE MAINVILLE: And eventually negotiations began with ORLTC.

PAUL DOOYEWEERD: You know, I believe at the time, they were -- it was just RTG. I think OLRTC came into existence after contract award.

CATHERINE MAINVILLE: I think it may have been called the Design Build Joint Venture, potentially.

PAUL DOOYEWEERD: Yeah, DBJV, correct. Yeah.

CATHERINE MAINVILLE: And do you recall whether you were mostly engaging with SNC-Lavalin.

PAUL DOOYEWEERD: We did have a couple of meetings at their offices, yes.

CATHERINE MAINVILLE: Did you have any understanding what role SNC was playing in the consortium, what, if any, particular role.

PAUL DOOYEWEERD: Not completely. At that point, I do know that they wrote a CBTC systems specification which formed part of our contract over and above the project agreement.

CATHERINE MAINVILLE: And what was your

view of the requirements, you know, in terms of prescriptiveness? Were there any concerns there for the signalling system.

PAUL DOOYEWEERD: Well, from the perspective of the project agreements, the signalling system requirements were actually quite prescriptive about architecture and not so much what the system needed to do but how it needed to do it.

It seemed to me to be a description of somebody else's signalling system. It was very, very prescriptive of that architecture and what the various components were, but it was prefaced with a statement that systems with similar or the same functionality level of safety and redundancy would be acceptable.

CATHERINE MAINVILLE: Did you have any understanding of whether those requirements came from some -- well, of where they originated from.

PAUL DOOYEWEERD: I'm not entirely certain. It would have almost certainly been a consultant that the City would have hired to -- to write that specification.

CATHERINE MAINVILLE: Do you have any awareness of an earlier fail (phonetic) procurement

with -- relating to Siemens for an Ottawa line.

PAUL DOOYEWEERD: No.

CATHERINE MAINVILLE: And so did this prescriptiveness ultimately cause some challenges for Thales.

PAUL DOOYEWEERD: I think it just required us to take a very good look at our architecture and verify that our system met the same functional and -- and safety and availability requirements.

CATHERINE MAINVILLE: And so you were able to -- at least some of the prescriptive requirements were able to be accommodated.

PAUL DOOYEWEERD: M-hm. Yeah. I would say in some -- in some ways, our system is actually more reliable than what was specified.

CATHERINE MAINVILLE: Was there any service-proven requirement in respect of the signalling system?

PAUL DOOYEWEERD: That, I don't recall.

CATHERINE MAINVILLE: How would you characterize Thales' system of this project in terms of whether it was -- it had new components or anything you knew about it or how standard it was.

PAUL DOOYEWEERD: No. This is just a

deployment of our standard product. The same product's been deployed in many cities.

CATHERINE MAINVILLE: Did it require a new design.

PAUL DOOYEWEERD: From an architecture perspective, no. But there's always going to be functions peculiar to each deployment, but nothing significant.

CATHERINE MAINVILLE: And was this the first time to your knowledge that Thales' signalling system was being integrated with an Alstom LRT.

PAUL DOOYEWEERD: An Alstom LRT, yes. As far as I know, yes.

CATHERINE MAINVILLE: And was that seen as a risk on the project.

PAUL DOOYEWEERD: No, not -- not particularly, as long as the rolling stock meets the interface requirements, shouldn't -- shouldn't really be a risk.

CATHERINE MAINVILLE: Did it ultimately become a challenge.

PAUL DOOYEWEERD: Sorry. That wasn't very clear.

CATHERINE MAINVILLE: Did it ultimately

become a challenge.

PAUL DOOYEWEERD: In terms of train control, the ability to accelerate and brake the trains, ultimately, no. But there were -- it took a while to get the information that we needed to design our system to control the train.

CATHERINE MAINVILLE: And do you recall whether any of these challenges were the result of Alstom and Thales being competitors.

PAUL DOOYEWEERD: It's impossible for me to say.

CATHERINE MAINVILLE: But do you have any -- did you observe any implications on the project of the two companies being competitors.

COURT REPORTER: Being what, ma'am?

CATHERINE MAINVILLE: Being competitors?

PAUL DOOYEWEERD: I -- I would say that there wasn't the level of cooperation that I had seen on previous projects.

CATHERINE MAINVILLE: And are you saying that's on Alstom's part, or is it both.

PAUL DOOYEWEERD: Well, from my perspective, on Alstom's part, but, yes.

CATHERINE MAINVILLE: And do you have

any sense of or understanding of why that was.

PAUL DOOYEWEERD: No.

CATHERINE MAINVILLE: Do you have any knowledge of the first vehicle supplier that was put forward by ORLTC or the Design-Build Joint Venture, CAF.

PAUL DOOYEWEERD: I know it was CAF, yes.

CATHERINE MAINVILLE: Did Thales have any discussions with CAF.

PAUL DOOYEWEERD: No. I've worked with CAF before on -- on other projects, but not on this one, no.

CATHERINE MAINVILLE: So it had just not reached that stage where it could have had meetings or discussions.

PAUL DOOYEWEERD: No. And -- and you typically don't during the bid stage. It's not until the contract is awarded. That's when you get together and start hashing through interface issues.

CATHERINE MAINVILLE: And so what was your -- when would have been your first meeting or discussion with Alstom.

PAUL DOOYEWEERD: I believe it was

August 2013.

CATHERINE MAINVILLE: So is that after both contracts were signed, or was that -- or after the -- at least after the award.

PAUL DOOYEWEERD: Sorry. I can't -- can't really hear you.

CATHERINE MAINVILLE: Is that after the award, then?

PAUL DOOYEWEERD: Yes, it was after the award. I -- I don't recall when reward -- award was. I think it was March or perhaps April of 2013.

CATHERINE MAINVILLE: Right. So it was even after the subcontract was signed.

PAUL DOOYEWEERD: Yes. Yes.

CATHERINE MAINVILLE: So there were no earlier meetings during contract negotiation or anything like that.

PAUL DOOYEWEERD: No.

CATHERINE MAINVILLE: At least not on the technical side.

PAUL DOOYEWEERD: Not -- not on the technical side, no.

CATHERINE MAINVILLE: Would you ever expect any earlier meetings to plan for the

technical aspects or the interface between the two?

PAUL DOOYEWEERD: Based on my experience on prior projects, I would say no, I don't -- I don't ever recall engaging other subcontractors prior to contract award.

CATHERINE MAINVILLE: Not prior to contract award, but prior to -- well, during contract negotiations, during the --

PAUL DOOYEWEERD: No.

CATHERINE MAINVILLE: -- negotiating -- the negotiation of the terms, no.

PAUL DOOYEWEERD: No. You typically don't.

CATHERINE MAINVILLE: But were you involved at all in the contract negotiations.

PAUL DOOYEWEERD: No.

CATHERINE MAINVILLE: You're not aware of who handled that on both RTC's (INDISCERNIBLE) --

COURT REPORTER: On what, ma'am?

CATHERINE MAINVILLE: Both RTC's end?

PAUL DOOYEWEERD: I -- I didn't hear the question clearly.

CATHERINE MAINVILLE: Did you have any knowledge of who handled that on ORLTC's end.

PAUL DOOYEWEERD: I would have to say no.

CATHERINE MAINVILLE: And so in terms of ensuring alignment between the signalling systems suppliers subcontract and the rolling stock suppliers subcontract, I take it that would just be the responsibility of the contract of ORLTC.

PAUL DOOYEWEERD: Yes, but I think what they did was they just flowed down the relevant sections of the project agreement.

CATHERINE MAINVILLE: That was your understanding of Thales' subcontract.

PAUL DOOYEWEERD: Yes.

CATHERINE MAINVILLE: Did you ever have any insight or knowledge of Alstom's contract.

PAUL DOOYEWEERD: No. Yeah, we did have a complete copy of the project agreement, so there is a rolling stock section in there. We had exposure to that. I assume that was flowed down to Alstom. Whether or not there were more requirements flowed down to Alstom, we -- we don't know.

CATHERINE MAINVILLE: Did you come to understand that there was some level of misalignment in the course of the project.

PAUL DOOYEWEERD: Yeah, you could see the misalignment in the PA.

CATHERINE MAINVILLE: Oh, in the PA itself.

PAUL DOOYEWEERD: Yeah.

CATHERINE MAINVILLE: How was that.

PAUL DOOYEWEERD: If you read through the -- the rolling stock section, there would be some mention of interfaces with CBTC that were not mentioned in the CBCT section. That's not all that unusual. These specifications are very large. They're put together by multiple people. Invariably, there will be disconnects.

CATHERINE MAINVILLE: And is that in terms of timing of certain deliverables? Or what --

PAUL DOOYEWEERD: No. Just -- no, just requirements, what -- what the systems are required to do.

CATHERINE MAINVILLE: Did that end up causing challenges, or did that have any implications.

PAUL DOOYEWEERD: No, I don't think --

COURT REPORTER: Sorry, ma'am. Could you repeat it? I'm sorry.

CATHERINE MAINVILLE: Did that end up causing challenges, or did it have any implications?

PAUL DOOYEWEERD: Not really because we were aware of them early on, so we could address them early on.

CATHERINE MAINVILLE: And so were you involved in any meetings with the City or its advisors early on in the project.

PAUL DOOYEWEERD: No, I don't think so, don't recall.

CATHERINE MAINVILLE: Were there any discussions with ORLTC early on about integration planning.

PAUL DOOYEWEERD: Not that I recall.

CATHERINE MAINVILLE: And what would have been your expectation in that regard should -- you know, would you have been involved in many other projects, should -- is there usually more early exchanges on the -- about the integration between all the parties.

COURT REPORTER: Between who?

CATHERINE MAINVILLE: Between all of the parties.

PAUL DOOYEWEERD: Normally, there would

be early on a focus in ensuring that the development schedules of the subcontractors are aligned. I -- I got the sense. I don't know for sure, but I got the sense that there was a misalignment between the signalling schedule and the rolling stock schedule.

CATHERINE MAINVILLE: And did the parties, by that, I mean Alstom and Thales, discuss early on how their respective systems would be integrated.

PAUL DOOYEWEERD: Yeah, we -- we -- that's -- I believe it was August was the first meeting we had, and that I think that meeting centred more around the -- the physical aspects of the signalling system: What's it look like; where is it going to go.

CATHERINE MAINVILLE: Do you recall Alstom entering the picture a bit late in the day in the procurement?

PAUL DOOYEWEERD: No. I think they -- my -- my understanding is they -- they signed their contract around the same time we did.

CATHERINE MAINVILLE: So you wouldn't have expected more meetings -- more early planning meetings with Alstom than that there was

ultimately.

PAUL DOOYEWEERD: No, I don't think so.

CATHERINE MAINVILLE: Did you understand early on what train model Alstom was putting forward.

PAUL DOOYEWEERD: Yes.

CATHERINE MAINVILLE: What was that? What was your understanding.

PAUL DOOYEWEERD: It was something they called the Alstom Citadis Spirit, so the Citadis is quite common in Europe, and the Spirit variant was a -- I guess a new variant targeted for the North American market.

CATHERINE MAINVILLE: Was this discussed at the first meeting in August 2013.

PAUL DOOYEWEERD: The specific model? No.

CATHERINE MAINVILLE: But by that point in time, did you understand what the model was.

PAUL DOOYEWEERD: Yeah. It was -- it was in the -- in our contract. It -- it told us what it was, yeah.

CATHERINE MAINVILLE: And so in your contract, it was already called the Citadis Spirit.

PAUL DOOYEWEERD: I can't say for sure.

I'd have to go back and look at it. We knew it was a North American variant, a new variant.

CATHERINE MAINVILLE: Is it fair to say you wouldn't have seen Alstom's bid proposal to ORLTC.

PAUL DOOYEWEERD: Correct.

CATHERINE MAINVILLE: Did you -- or do you now have a view as to whether the Citadis Spirit was service proven.

PAUL DOOYEWEERD: I can't really comment on that.

CATHERINE MAINVILLE: How would you describe the extent to which the Citadis model needed to be adapted for this project.

PAUL DOOYEWEERD: Again, I don't really know. I know I have seen -- for instance, I've seen pictures of the bogies, some of the Citadis in Europe, and I know what the bogie looks like here, and it's very, very different.

Now, why they're different and -- and what the differences -- what are driving the differences, I -- I don't know. We're not rolling stock suppliers.

CATHERINE MAINVILLE: So in light of that, do you have any view on the hundred percent

low-floor requirement.

PAUL DOOYEWEERD: No.

CATHERINE MAINVILLE: Because it doesn't directly impact the signalling system.

PAUL DOOYEWEERD: No, it doesn't -- it doesn't directly impact signalling. The train is just a hunk of metal that we need to move around.

CATHERINE MAINVILLE: Do you have any view as to the choice of an LRV for this project in terms of what the City was trying to accomplish in capacity and speed.

PAUL DOOYEWEERD: Well, I have a view, but it's just an opinion. I think they had to go with an LRV simply because of the topology of the guideway. It's -- they were reusing a bus transit way. There's a lot of tight turns. An LRV is the only type of vehicle that's going to be able to manoeuvre those turns.

CATHERINE MAINVILLE: Is it accurate to say that this project kind of pushed the LRV to its limits? It's kind of a super LRV? Maybe you could --

PAUL DOOYEWEERD: I -- I can't say. I -- I don't know.

CATHERINE MAINVILLE: Do you recall the

original plans relating to validation testing and how that changed.

PAUL DOOYEWEERD: From a signalling perspective.

CATHERINE MAINVILLE: Well, for the rolling stock but with potential implications for Thales.

PAUL DOOYEWEERD: I'm not sure I understand the question.

CATHERINE MAINVILLE: So let me start here: Do you recall that originally the first two LRV, the prototypes were supposed to be manufactured in France.

PAUL DOOYEWEERD: Yes. Yes, they were supposed to be manufactured and tested in France on their test track.

CATHERINE MAINVILLE: Right. So there would be some validation testing there.

PAUL DOOYEWEERD: Yeah. We would do what we call characterization testing which you always want to do on -- on flat track with no curves, actually measure train performance, see how it accelerates, see how it brakes, capture the data, and then use that in our -- our control logarithms.

CATHERINE MAINVILLE: So is that a Thales test, or it's simply a test that is relevant to Thales because of the data.

PAUL DOOYEWEERD: It would be a Thales test. It would be a very specific -- what we call train characterization testing.

CATHERINE MAINVILLE: So I take it there were discussions about Thales conducting those tests.

PAUL DOOYEWEERD: There would have been, yes.

CATHERINE MAINVILLE: Would that have been discussed, then, with ORLTC and/or with Alstom at the August 2013 meeting.

PAUL DOOYEWEERD: It would have been ORLTC.

CATHERINE MAINVILLE: And do you recall whether Thales was consulted about the change of locations with the two prototype vehicles.

PAUL DOOYEWEERD: Depends what you mean by consulted. We were told.

CATHERINE MAINVILLE: So when do you recall that happening.

PAUL DOOYEWEERD: I -- it was a long time ago. I -- I don't remember specifically when

it happened.

CATHERINE MAINVILLE: And so when you were told, what did you expect then have took [sic] place? What would have been...

PAUL DOOYEWEERD: Well, as I recall, the plan changed. The -- the first two vehicles were going to be built in Hornell, New York, and then they were going to be shipped to a test track. I believe it was in Colorado for Alstom because Alstom would have to do lot of testing on a test track. And then we would just piggyback onto the end of that and do our characterization testing on the same test track.

CATHERINE MAINVILLE: Okay. So there was still a plan to do the characterization testing in Colorado instead.

PAUL DOOYEWEERD: Right.

CATHERINE MAINVILLE: And the characterization testing, is that the same as automated speed control testing.

PAUL DOOYEWEERD: No. It's -- it's -- it's a test that's specifically done to capture the train's response to propulsion and braking commands. So what -- what we do is we ask the rolling -- the rolling stock supplier for

performance data. You know, tell us how this train accelerates. Tell us how the train decelerates. And then we'll do characterization testing to confirm that data, and then once we know how the train performs, we can modify the parameters in our speed control software to suit the train.

CATHERINE MAINVILLE: That's the characterization testing.

PAUL DOOYEWEERD: The characterization testing is about capturing the train response so we can know how to set the parameters in our speed control software.

CATHERINE MAINVILLE: And how important is that for...

PAUL DOOYEWEERD: It -- it's useful. I wouldn't say it's critical.

CATHERINE MAINVILLE: Okay.

PAUL DOOYEWEERD: It helps get to a well-controlled train faster.

CATHERINE MAINVILLE: And so the automated speed control testing is different, you said.

PAUL DOOYEWEERD: Correct.

COURT REPORTER: Who did you say, ma'am? Who made it?

CATHERINE MAINVILLE: Automated speed control testing is different, you said. Was that a testing that was planned on the prototype vehicles early on.

PAUL DOOYEWEERD: No. No. That's something you would do on the revenue system.

CATHERINE MAINVILLE: And so what ended up happening with the Colorado plan? Did that take place.

PAUL DOOYEWEERD: No, it did not.

CATHERINE MAINVILLE: Why is that.

PAUL DOOYEWEERD: I -- I don't know.

CATHERINE MAINVILLE: What was Thales subsequently told, or happened with them next.

PAUL DOOYEWEERD: Well, we were basically -- I don't recall specifically, but the trains were not going to go to a test track in Denver. They were going to deliver directly to Ottawa.

CATHERINE MAINVILLE: And did you understand that you would be able conduct this testing in Ottawa.

PAUL DOOYEWEERD: Correct. It's not ideal, though, because there is no part of this guideway that's on zero grade.

CATHERINE MAINVILLE: I see. That's straight, is that what that means.

COURT REPORTER: That's what, ma'am?

CHRISTINE MAINVILLE: That is straight.

PAUL DOOYEWEERD: It's -- there are no zero grade sections on this guideway. There's always a slope.

CATHERINE MAINVILLE: Oh, okay. Zero grade means flat.

PAUL DOOYEWEERD: Right.

CATHERINE MAINVILLE: And was Thales able to conduct this testing.

PAUL DOOYEWEERD: Yeah, it's -- it's not ideal because when you have a grade, gravity is always going to affect your acceleration and braking. I know Alstom had the same challenge when they do their testing. They -- they really want to be on a -- on a level grade.

CATHERINE MAINVILLE: Was that testing delayed because of the changes in location or for some other reason.

PAUL DOOYEWEERD: I -- honestly, I don't recall. I know the testing was delayed, but I don't know that it was specifically because of that.

CATHERINE MAINVILLE: Was Thales able to do that testing on the prototypes before having to manufacture, I suppose, the signalling system for the additional trains for their fleet.

PAUL DOOYEWEERD: I don't recall, but that testing isn't required to -- you wouldn't expect any manufacturing changes. The -- the speed control software is -- is software. It doesn't change the hardware.

CATHERINE MAINVILLE: But ideally, would you still do the prototype testing first to adjust the software, or it doesn't matter.

PAUL DOOYEWEERD: It doesn't really matter.

CATHERINE MAINVILLE: Do you recall, then, Alstom's validation testing being delayed.

PAUL DOOYEWEERD: I can't say. I don't know what their schedule was.

CATHERINE MAINVILLE: Were you aware of what particular issues Alstom faced in their manufacturing, their train assembly.

PAUL DOOYEWEERD: No.

COURT REPORTER: In their which assembly?

CATHERINE MAINVILLE: Train assembly.

PAUL DOOYEWEERD: No. We had -- we had no visibility into their schedule or their challenges.

CATHERINE MAINVILLE: Were you or Thales at the MSF at all.

PAUL DOOYEWEERD: Yes.

CATHERINE MAINVILLE: Was there a lot of work to be done at Thales.

PAUL DOOYEWEERD: In -- in terms of.

CATHERINE MAINVILLE: Well, yes, I'm just wondering, was there a Thales team on site for some of the -- like, where were the VOBCs and the signalling systems actually built --

COURT REPORTER: The which and the signalling systems?

CATHERINE MAINVILLE: The VOBC and signalling system, where is that actually manufactured --

PAUL DOOYEWEERD: Sorry. You're --

CATHERINE MAINVILLE: -- in terms -- in terms of the hardware?

COURT REPORTER: In terms of what?

CATHERINE MAINVILLE: Hardware.

PAUL DOOYEWEERD: Sorry. I'm really having a hard time hearing the question.

CATHERINE MAINVILLE: There was equipment, right, that Thales -- I mean, it's -- it's a piece of equipment in the VOBC.

PAUL DOOYEWEERD: M-hm.

CATHERINE MAINVILLE: So was that -- where was that built -- manufactured.

PAUL DOOYEWEERD: Well, the components were built at various subcontractors that we use, and they were all delivered to Ottawa. And then the assemblies were installed in the trains in Ottawa.

CATHERINE MAINVILLE: Were they installed by Thales.

PAUL DOOYEWEERD: No. Installed by Alstom.

CATHERINE MAINVILLE: So I guess I'm trying to get a sense of how much work Thales actually did on site and how -- for example, the manufacture --

COURT REPORTER: I couldn't hear the end.

PAUL DOOYEWEERD: Can't hear it.

CATHERINE MAINVILLE: I guess I'm wondering how much work did Thales do on site in Ottawa during the manufacturing phase?

PAUL DOOYEWEERD: Well, in terms of installation of signalling equipment on the trains, that was Alstom's responsibility, and then signalling equipment in track side, wayside, was done by ORLTC. So we had -- I wouldn't call it supervisory, but we -- we did have some oversight, but installation was not our responsibility.

CATHERINE MAINVILLE: So would that mean that Thales' team in Ottawa was fairly limited?

PAUL DOOYEWEERD: No. No. We had a team there that was primarily focused on the testing and commissioning of the system.

CATHERINE MAINVILLE: During the testing and commissioning phase?

PAUL DOOYEWEERD: M-hm. Yes.

CATHERINE MAINVILLE: And so before then, what did Thales' presence in Ottawa look like?

PAUL DOOYEWEERD: We had a relatively small team. We had an experienced site manager. He'd been through this many, many times. He's helping out and -- and keeping an eye -- a watchful eye over what they were doing.

CATHERINE MAINVILLE: Are you actually

located in Ottawa yourself during the project?

PAUL DOOYEWEERD: Sorry. I -- I didn't hear the question.

CATHERINE MAINVILLE: Are you located in Ottawa yourself?

PAUL DOOYEWEERD: Me personally? No. Toronto.

CATHERINE MAINVILLE: So did you mostly work from Toronto?

COURT REPORTER: Sorry? Could you repeat that, ma'am?

CATHERINE MAINVILLE: I'm sure there's an audio issue that I can fix here. Is this better?

COURT REPORTER: I'm not sure yet.

CATHERINE MAINVILLE: Sorry?

COURT REPORTER: I'm not sure yet.

CATHERINE MAINVILLE: Okay. So did you mostly work from Toronto?

PAUL DOOYEWEERD: Yes.

CATHERINE MAINVILLE: And so in terms of use of the MSF for some of the work to be done on site, what did that look like for Thales?

PAUL DOOYEWEERD: I'm not sure I understand the question.

CATHERINE MAINVILLE: Well, I mean, the MSF was used by Alstom to a significant extent for the train assembly, correct?

PAUL DOOYEWEERD: Correct. Yeah.

CATHERINE MAINVILLE: So was Thales working at -- in the MSF? What was it doing in the MSF?

PAUL DOOYEWEERD: That we were working on our own, our own subsystems. We've got a lot of equipment installed at the MSF, yard control. The central servers are there. But in terms of train supply, that's a different part of the MSF. It's off limits to us.

CATHERINE MAINVILLE: Okay. So you were in a different section, and work was being there by Thales?

PAUL DOOYEWEERD: Correct.

CATHERINE MAINVILLE: And was the MSF suitable as a facility for Thales' work?

PAUL DOOYEWEERD: Yes, given that our responsibility was to install our -- make sure our equipment was installed properly in the MSF, yes. It's the only place to do it.

CATHERINE MAINVILLE: Because you would always do it on site, that project?

PAUL DOOYEWEERD: Yeah, what we do is make sure our equipment is installed on site.

CATHERINE MAINVILLE: And were you there, then, only later on when the components were ready? Would you have been working in the MSF, you know, early --

PAUL DOOYEWEERD: No. We have a -- we have a separate team, a site team led by the site manager that -- that manages all onsite activities. It's not something I was personally involved in.

CATHERINE MAINVILLE: Do you have any understanding of whether the MSF was suitable for Alstom's manufacturing or assembly?

PAUL DOOYEWEERD: I can't really comment on that.

CATHERINE MAINVILLE: From Thales' perspective, did the budget cause any concerns?

PAUL DOOYEWEERD: No, not -- not -- not in particular. No.

CATHERINE MAINVILLE: Were there any cost-saving measures discussed with the ORLTC that impacted Thales?

PAUL DOOYEWEERD: Yeah, the -- the only one I recall was the -- the project agreement called for the provision of track circuits which we

used as a secondary method to detect trains.

And there was -- I think they called that an innovation proposal to remove that secondary detection system which the City did agree to do, so that -- that did impact us.

CATHERINE MAINVILLE: And what does that mean? What is that detection system? What does it do?

PAUL DOOYEWEERD: Well, normally, the trains are communicating -- the trains know where they are. They're communicating their position over wireless radio to the central computers, so the central computers know where all the trains are. They know how fast they're going. They know where they're going.

But if you have a train that has a failure of its onboard signalling system, or if you have a maintenance vehicle that doesn't have signalling equipment on it, there's no way for the system to know that the train is there.

So a track circuit is a device mounted to the rails that can detect a train electrically through the rails. And it's called a -- we refer to it as a secondary detection system.

So there was a requirement in the

project agreement to have that secondary detection system, and that was subsequently descoped.

CATHERINE MAINVILLE: And why would you want a secondary detection system?

PAUL DOOYEWEERD: Primarily to detect maintenance vehicles. In some systems, you have what's called a mixed-mode operation where some trains are equipped and some trains are not equipped with signalling systems, so you need that secondary system to detect the non-equipped trains.

In a system like this, you don't necessarily need secondary detection. It is a closed system. There are only LRVs and the odd maintenance vehicle on the guideway.

CATHERINE MAINVILLE: So you don't see this as having had any implications down the road?

PAUL DOOYEWEERD: We don't. No.

CATHERINE MAINVILLE: Are you able to speak to the plans for an automated yard and how that changed?

COURT REPORTER: And what, ma'am?

CATHERINE MAINVILLE: How that changed.

PAUL DOOYEWEERD: Well, the plan for automation never changed. The -- the intent was always to operate the yard without drivers. So we

have a mode called unattended train operation where the trains will drive without anybody on board.

So that was a requirement from Day 1. That's something that our product supports. What did change with the MSF was it got bigger, so there was at some point a decision -- because of the east and west extensions, they would need more trains. There was a decision made to procure those additional trains now while Alstom is producing the first batch.

So instead of delivering -- I think it was 34 for the base contract -- deliver 72, and they've got enough to cover the east and the west extensions. And of course, when they did that, they would need a place to put those trains. So the MSF was not big enough for that many trains, so they redesigned the MSF to expand the storage capability.

CATHERINE MAINVILLE: And as a result, they have not yet automated the job?

PAUL DOOYEWEERD: Yeah, what they did was they went and redesigned the MSF at the end of the tracks which basically meant that our software no longer represented the MSF as built, so we -- we got a variation to change our MSF design. And so

our -- our design now matches the actual MSF topology, but we have not completed the testing of the MSF.

CATHERINE MAINVILLE: And is there a reason that's being delayed?

PAUL DOOYEWEERD: It really just comes down to -- to access to tests. We need to have possessions. We need to be able to run our tests. A lot of our tests need special software -- test software builds, so we can't run them while they're running revenue service. So a lot of our testing is restricted to off-revenue hours.

But I think the other problem we have is off-revenue hours, they're very busy trying to make sure they have enough trains to support revenue the next day. So we're just not getting the time that we need to complete our test program.

CATHERINE MAINVILLE: Does that have any implications for Thales, or you're just ready to do it whenever you're asked to do it?

PAUL DOOYEWEERD: We're -- we're ready. It's just -- it's just delaying the schedule.

CATHERINE MAINVILLE: Are you involved in the Stage 2 trains?

PAUL DOOYEWEERD: Well, the Stage 2

trains are actually a variation on Stage 1. It's -- it's -- the trains themselves are part of the Stage 1 contract.

CATHERINE MAINVILLE: So you mean the variation just in terms of numbers?

PAUL DOOYEWEERD: Yeah.

CATHERINE MAINVILLE: But are you involved in the manufacturing of them? The --

PAUL DOOYEWEERD: Yeah. We're just -- we're just producing more onboard equipment, and Alstom is installing our onboard equipment, no -- no different than the original batch of trains. It's just a quantity change.

CATHERINE MAINVILLE: Has that gone more smoothly than the Stage 1 trains, then?

PAUL DOOYEWEERD: I -- I would -- to some extent, yes. It's not as smooth as it -- as we'd like it to be.

CATHERINE MAINVILLE: Why are there still some challenges?

PAUL DOOYEWEERD: Just not getting the trains when we're supposed to.

CATHERINE MAINVILLE: So just in terms -- just they're being delayed in terms of being --

PAUL DOOYEWEERD: They're being -- they're being delayed, and I -- I don't know why.

CATHERINE MAINVILLE: But in terms of your earlier integration issues, would those be resolved for the Stage 2 trains?

PAUL DOOYEWEERD: Once you resolve the integration issue, it -- the solution applies to all trains.

CATHERINE MAINVILLE: Right. Because you would have -- whenever issues were encountered in 2019 and so forth, fixes were made, and those would, of course, be applied to the new -- the new -- the new --

PAUL DOOYEWEERD: On -- on the signalling side, the -- the fixes have all been software fixes. Once you fix software on one train, you deploy it everywhere. It's fixed on every train.

Now, on the Alstom side, I think there have been some hardware changes as well, so these need to be applied train by train.

CATHERINE MAINVILLE: It's fair to say that for software, the more you -- this is software that applies to projects like this -- the more you use the system or run the trains, the more reliable

that becomes?

PAUL DOOYEWEERD: I -- I wouldn't say it becomes more reliable. I'd say you have more confidence in its reliability.

CATHERINE MAINVILLE: And am I right that the reverse can be said about hardware, not that it loses reliability, but the more you run it, the more it -- it wears.

PAUL DOOYEWEERD: Yeah. Hardware wears, and failures -- failures are inevitable, yes, that's -- software doesn't wear out if that's what you're getting at.

CATHERINE MAINVILLE: What would you say is unique at Thales' signalling system?

PAUL DOOYEWEERD: As compared to other signalling systems? It -- it's very hard for me to say because I don't have a lot of exposure to other systems.

CATHERINE MAINVILLE: Okay.

PAUL DOOYEWEERD: I have spoken to people that have experience with multiple signalling systems, and they say that ours is -- is, you know, one of the most reliable and one of the most feature-filled systems.

CATHERINE MAINVILLE: Were there any

risks perceived on this project in terms of whether the scheduling or the number of interfaces on the project or anything like that?

PAUL DOOYEWEERD: In terms of interfaces, no. No. There's actually relatively few interfaces on this project. I've certainly seen projects with more.

CATHERINE MAINVILLE: You mean from --

PAUL DOOYEWEERD: The only -- from a scheduling perspective, yeah. I think we -- we started too early.

CATHERINE MAINVILLE: Too early?

PAUL DOOYEWEERD: Yeah. If you look at it, I think signalling, rolling stock, and civil design all started at the same time. Normally, the civil design starts -- or takes longer, and signalling comes in once the track has been designed, and you know what the speed limits are and...

CATHERINE MAINVILLE: Wouldn't that just have delayed Thales? I mean, what other impact would it -- would that have?

PAUL DOOYEWEERD: Yeah. It's just a question of having too much time, and when you have too much time, you spend too much money, and you've

got to be careful.

CATHERINE MAINVILLE: By not doing too much work too early, that --

PAUL DOOYEWEERD: Right.

CATHERINE MAINVILLE: So is it fair to say that Thales had to redesign things along the way?

PAUL DOOYEWEERD: Yeah, that -- that's inevitable. But the focus early on was just getting the -- the hardware designs complete because once they're done, they typically don't change. The software development started later. That's where the -- the functional behaviours come from.

CATHERINE MAINVILLE: So are you saying that, in the overall schedule, that ultimately ended up in a bit of a crunch back then?

PAUL DOOYEWEERD: Not -- I don't think it's because of the schedule. I think the crunch came from just things not coming through when they should have.

CATHERINE MAINVILLE: In terms of the guideway, the rolling stock, and the various --

PAUL DOOYEWEERD: Yeah. All -- all of the external interfaces, yeah.

CATHERINE MAINVILLE: And so was Thales -- were you involved in the changing schedules and those discussions with ORLTC about how much time Thales would have for any given test?

PAUL DOOYEWEERD: Not -- not to any large extent, no. That would normally be the site team or deployment team looking after that.

CATHERINE MAINVILLE: From where you stood, did you see pressure or a lot of restrictions on the time your team would have to run the tests, the various tests that needed to be done?

PAUL DOOYEWEERD: Yeah, I do recall that -- that getting test time was -- was a challenge. It always is. You have multiple subcontractors. All of them want the tests, and we can't all test at the same time.

CATHERINE MAINVILLE: Was there any particular impact of the sinkhole for you or for Thales on this project?

PAUL DOOYEWEERD: Other than the delay in getting the guideway built, no.

CATHERINE MAINVILLE: And would that have only delayed the full integration testing or some of this testing?

PAUL DOOYEWEERD: Well, it would have -- it would have delayed the testing in the tunnel section because that section was -- was available to us much later than originally planned.

CATHERINE MAINVILLE: You said there were relatively few interfaces on this project. Do you mean from Thales' perspective or really overall?

PAUL DOOYEWEERD: Thales' perspective. I --

CATHERINE MAINVILLE: So --

PAUL DOOYEWEERD: I can't say overall.

CATHERINE MAINVILLE: In terms of who you had to deal with?

PAUL DOOYEWEERD: Correct.

CATHERINE MAINVILLE: Was there any challenge relating to not having some sort of contractual relationship or commercial relationship of some sort with the rolling stock supplier directly?

PAUL DOOYEWEERD: That's a -- it's a tough question. You typically don't in -- in projects like this, have contractual relationships with other subcontractors. It's all managed through the system integrator, and it's really up

to the system integrator to -- to manage any interface issues.

CATHERINE MAINVILLE: And does that include the operator?

PAUL DOOYEWEERD: Yeah, the operator would be another interface.

CATHERINE MAINVILLE: In this case, for instance, there was no direct relationship between Thales and the operator?

PAUL DOOYEWEERD: No.

CATHERINE MAINVILLE: And so you would go through ORLTC as well?

PAUL DOOYEWEERD: Everything's through ORLTC, yes.

CATHERINE MAINVILLE: And is that typical as well for the operations side of it?

PAUL DOOYEWEERD: Yes. And typically, the operator is just another subsystem. They just happen to be humans, but they're another actor, same with maintainers.

CATHERINE MAINVILLE: This project could be fully automated -- I mean, it is fully automated, but the trains could run by themselves without drivers, correct?

PAUL DOOYEWEERD: They -- they could --

from a signalling perspective, absolutely they could. From an overall integrated system perspective, I would say no.

CATHERINE MAINVILLE: Why is that?

PAUL DOOYEWEERD: There's too high a risk of -- of people getting on the -- on the track. If you're going to have a truly unattended system, you either have to be certain that people aren't going to get on the track or that the train is able to detect people on the track.

CATHERINE MAINVILLE: And are there any implications to Thales to having drivers losing the system, the...

PAUL DOOYEWEERD: No. When they run an automated ATO mode, as we call it, the full automated mode, it's effectively like a driverless train except the driver has to push a button every 20 seconds to confirm that he's paying attention. But the trains are driving themselves. They're --

CATHERINE MAINVILLE: Yes.

PAUL DOOYEWEERD: -- stopping and aligning on their own.

CATHERINE MAINVILLE: Are you able to speak to how this project compared to others? Aside from anything you've already pointed to, was

there anything else you're able to point to that made this project different in some significant way?

PAUL DOOYEWEERD: As compared to other projects, two things stand out to me at a -- at a high level. Number 1, it's been a very long, long project. Three years is more typical, even less.

And the other thing that stood out to me is that, on other projects I've worked on, you typically have large contingents of operators and maintainers involved in reviews early on understanding the system, telling us what their concerns are, what their operational needs are, and that that really didn't happen here.

CATHERINE MAINVILLE: And do you know why? Do you have a sense of why?

PAUL DOOYEWEERD: I don't know why.

CATHERINE MAINVILLE: Would Thales normally work with something like a concept of operations?

PAUL DOOYEWEERD: Yes. But to have a concept of operations, you'd need stakeholders, so you need your operators involved in that.

CATHERINE MAINVILLE: Right so I take it you did not have that?

PAUL DOOYEWEERD: No. Not -- not early in the project, we didn't have it, no.

CATHERINE MAINVILLE: Are you usually on -- other projects, are you usually dealing with experienced train operators?

COURT REPORTER: With which, ma'am?

CATHERINE MAINVILLE: Experienced train operators.

PAUL DOOYEWEERD: Yes. Yes. But typically what happens -- what I've seen happen on other projects is your first meeting is really an opportunity for us to describe to the operators and maintainers how our system works.

The second meeting is them coming back with, okay, this is how we want you to tailor this to our needs, and it's -- happens very early in the project.

CATHERINE MAINVILLE: And did these meetings, then, only end up happening very late in the day or not really at all?

PAUL DOOYEWEERD: I think the real operator involvement started perhaps six months before revenue service.

CATHERINE MAINVILLE: And what implications did that have?

PAUL DOOYEWEERD: Well, the implications are the system's already been designed. It's -- it's a little bit late for this kind of feedback.

CATHERINE MAINVILLE: And so did that result in, like, changes to the design or to Thales saying, sorry, it can't be fixed?

PAUL DOOYEWEERD: A bit of both.

CATHERINE MAINVILLE: Oh, a bit of both.

PAUL DOOYEWEERD: Yeah.

CATHERINE MAINVILLE: Do you recall what types of changes to the design or to the system the City was looking for at that juncture?

PAUL DOOYEWEERD: I don't recall. There -- there were a number of lists floating around, but there wasn't one consolidated list of issues. But normally, when you -- when you hand over for trial operations, normally, there's an agreed punch list which is a list of issues that -- that need to be resolved so the system is accepted pending the resolution of a list of items. And that -- we don't have one here.

CATHERINE MAINVILLE: Well, are you aware of the minor deficiencies list for the term

sheet or that existed at the time of revenue service as between RTG and the City with --

PAUL DOOYEWEERD: I would have to say no. I know there were, like I said, a number of lists I saw, but I don't know that there was one agreed, consolidated list.

CATHERINE MAINVILLE: So to the best of your recollection, were there any outstanding items that Thales had to address post-revenue service?

PAUL DOOYEWEERD: On the agreed list? I -- I don't recall seeing the list.

CATHERINE MAINVILLE: Or just generally that you knew had not been dealt with prior to RSA but that was on Thales' list of things to do prior to --

COURT REPORTER: Prior to what, ma'am?

CATHERINE MAINVILLE: Post. Sorry. Post-RSA.

PAUL DOOYEWEERD: I can't really say offhand. I'd have to go back and look.

CATHERINE MAINVILLE: Okay. And perhaps this question is subsumed by your earlier answer, but were there unanticipated challenges to the project that were out of the ordinary?

COURT REPORTER: Out of the what,

ma'am?

CATHERINE MAINVILLE: The ordinary.

PAUL DOOYEWEERD: Yeah. I think just the -- the delays. It's very -- very unusual to experience this many delays.

CATHERINE MAINVILLE: Is that to the infrastructure or the rolling stock or the --

COURT REPORTER: I can't hear you, ma'am.

PAUL DOOYEWEERD: Well, certainly -- certainly the infrastructure, rolling stock, maybe, maybe not. I -- I don't have enough visibility into the rolling stock schedule.

CATHERINE MAINVILLE: Sorry. My question for the court reporter was just whether that was relating to the infrastructure or the rolling stock or all of the above.

Okay. But for the infrastructure, from Thales' perspective, was that mostly relating to the track, then?

PAUL DOOYEWEERD: And the stations.

CATHERINE MAINVILLE: Right. Which impacts Thales because the signalling system also has to be --

PAUL DOOYEWEERD: Installed in some of

the stations, yes.

CATHERINE MAINVILLE: And so was that Rideau Station in particular that was delayed to your recollection?

PAUL DOOYEWEERD: I don't recall. We don't -- we don't actually have much installed at Rideau. Most of our equipment is at Tunney's Pasture, University of Ottawa, Tremblay, and Blair.

CATHERINE MAINVILLE: And you were delayed --

PAUL DOOYEWEERD: There were some delays there, yeah.

CATHERINE MAINVILLE: My final question: Do you have a view as to what led to all the issues that the system faced during service operations, so in terms of, you know, the breakdown, derailments. In terms of root causes or looking back in hindsight, are you able to speak to what you think could have been a contributing factor?

PAUL DOOYEWEERD: I -- the only thing that comes to mind is it's just not paying enough attention early on to integration issues, making sure that the plans align, make sure the systems work together as intended.

CATHERINE MAINVILLE: And my apologies. I said that that was my last question. But I wanted to follow up on your last point about the maintenance not being involved early on.

Did that -- just like the operator wasn't involved early enough in the project, do you know what implications that may have had on maintenance ultimately? Were there things that they would have liked to facilitate maintenance that couldn't be accommodated or anything like that?

PAUL DOOYEWEERD: Well, yeah. We actually got a list earlier this week that -- based on the -- the issues on the list, I'd have to say they came from maintenance, and it's related to yard operations, so a lot of new requests.

CATHERINE MAINVILLE: Thank you for that.

Peter was there anything you wanted to ask?

PETER MANTAS: Sorry, counsel. Were you speaking to me?

CATHERINE MAINVILLE: Yes. Yes.

PETER MANTAS: You cut out on me. Thanks.

CHRISTINE MAINVILLE: I asked if there was anything you wanted to ask before --

PETER MANTAS: No. Thank you, Christine. I have no reexamination or further questions.

The only thing, and it was obvious right there at the end. I think we've had some audio issues. Well, in fact, I think we all know we've had some audio issues throughout, so we'll obviously need to be very vigilant when we review the transcripts just to make sure that we capture any errors.

But other than that, it's all good. We're all done and ready to go off the record when you are.

CHRISTINE MAINVILLE: Yes, let's do that.

(DISCUSSION OFF THE RECORD)

-- Whereupon the Examination concluded at 11:46 a.m.

REPORTER'S CERTIFICATE

I, JANET BELMA, CSR, Certified Shorthand Reporter, certify;

That the foregoing proceedings were taken before me at the time and place therein set forth, at which time the witness was put under oath;

That the testimony of the witness and all objections made at the time of the examination were recorded stenographically by me and were thereafter transcribed;

That the foregoing is a true and correct transcript of my shorthand notes so taken.

Dated this 24th day of May, 2022.

NEESONS COURT REPORTING INC.

PER: JANET BELMA, CSR

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