Ottawa Light Rail Commission

Meeting No. 2
on Thursday, March 31, 2022

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OTTAWA LIGHT RAIL COMMISSION

MEETING NO. 2: THALES CANADA INC. - MICHAEL BURNS

MARCH 31, 2022

--- Held via Zoom Videoconferencing, with all participants attending remotely, on the 31st day of March, 2022, 11:00 a.m. to 2:18 p.m.

COMMISSION COUNSEL:

Christine Mainville, Co-Lead Counsel Member
Fraser Harland, Litigation Counsel Member

PARTICIPANTS:

Michael Burns: Thales Canada Inc.
Jennifer McAleer, Peter Mantas, and Maria Braker:
Fasken Law Firm

ALSO PRESENT:

Joanne Lawrence, Stenographer/Transcriptionist
Leila Heckert, Virtual Technician

-- Upon commencing at 11:00 a.m.

CHRISTINE MAINVILLE: Thank you, Mr. Burns. So the purpose of today's interview is to obtain your evidence under oath or solemn declaration for at the use at the Commission's public hearings.

This will be a collaborative interview such that my cocounsel, Mr. Harland, 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 or by way of procedural order before the hearings commence.

The transcript will be posted at the Commission's public website, along with any corrections made to it after it is entered into evidence, and you'll be given an opportunity to review your transcript and correct any typos or other errors before it is shared with the participants or entered into evidence. Any non-typographical corrections made will be appended to the transcript.

And just to notify you, that pursuant to Section 33(vi) 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 or her 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(vii) of the Public Inquiries Act, you are hereby advised that you have the right to object to answer any question under Section 5 of the Canada Evidence Act. So if that's all fine, I'll start the interview.

MICHAEL BURNS: Okay.

CHRISTINE MAINVILLE: Could you explain your role in Ottawa's LRT project? Stage 1, more specifically.

MICHAEL BURNS: My role is as the project manager for Thales Canada that was

providing the CBTC system to -- under subcontract agreement to OLRTC.

CHRISTINE MAINVILLE: Okay. And when did you start in that role of project manager?

MICHAEL BURNS: Shortly after the contract agreement was signed by Thales. That was April of 2013 that I joined.

CHRISTINE MAINVILLE: And did your involvement end with the project?

MICHAEL BURNS: The project has not ended for -- for Thales.

CHRISTINE MAINVILLE: And so you are still project manager?

MICHAEL BURNS: Oh, I'm still project manager.

CHRISTINE MAINVILLE: Okay. And could you speak to your -- briefly to your background and experience as it relates to this project.

MICHAEL BURNS: I was hired by Thales specifically for this project. Prior to that, I have many years of experience running similar -- similar complex projects in the aerospace and defence industry.

CHRISTINE MAINVILLE: Do you have engineering experience?

MICHAEL BURNS: No. I'm not an engineer.

CHRISTINE MAINVILLE: And I understand you have project management experience. Was this your first rail project?

MICHAEL BURNS: This was my first rail project.

CHRISTINE MAINVILLE: And have you done others since, or have you always been focussed on Ottawa's LRT?

MICHAEL BURNS: I've been primarily focussed on Ottawa LRT.

CHRISTINE MAINVILLE: Were you involved in the procurement of the work Thales provided for the Ottawa LRT?

MICHAEL BURNS: No, I was not involved. That predated my start at Thales Canada.

CHRISTINE MAINVILLE: Okay. And you indicated that Thales entered into a contract with OLRTC?

MICHAEL BURNS: Correct.

CHRISTINE MAINVILLE: Do you know whether it entered into a contract with any other entity as part of its role on this project?

MICHAEL BURNS: Yes. There was a

separate agreement entered into at the same time with Rideau Transit Maintenance.

CHRISTINE MAINVILLE: And that related to the maintenance of the OLRT?

MICHAEL BURNS: It related to the maintenance of -- maintenance support to RTM that came in -- came into effect after the -- the revenue service start of the Stage 1 system.

CHRISTINE MAINVILLE: And you indicated that Thales was contracted to deliver the CBTC system. Could you speak a little bit more about what it was that Thales was to deliver on this project.

MICHAEL BURNS: Yes. We were to deliver the onboard computer systems onto the -- onto the LRVs, along with other peripheral systems necessary for this -- our CBTC system to monitor and control the movement of the LRV, and in support of that -- that primary objective, we also provided electromechanical systems that supported that detection of train movements and train operations along the guideway, and thirdly, we provided operator control centre systems to allow the operator - it would be OC Transpo - to monitor and operate the movement of trains.

CHRISTINE MAINVILLE: Okay. And is -- is the -- the main deliverable what could be called the signalling system?

MICHAEL BURNS: Correct.

CHRISTINE MAINVILLE: Okay. And am I right that that's composed of both the CBTC and the VOBC system?

MICHAEL BURNS: They are not separate. The VOBC system, for lack of a better description, would be an onboard control system. But it -- it's an integral part to the overall signalling system that entails CBTC.

CHRISTINE MAINVILLE: Okay. And what does CBTC stand for?

MICHAEL BURNS: Communication-based train control.

CHRISTINE MAINVILLE: And --

MICHAEL BURNS: So --

CHRISTINE MAINVILLE: Sorry, yep.

MICHAEL BURNS: There's a significant software component beyond the -- the physical hardware. That software is tailored to the -- to the application in Ottawa. It's not new software developed for Ottawa. The software existed, had been validated as a product. The software

development that Thales undertook was adaptation of that software to meet the physical environment that the system would operate in as well as other parameters dictated by the project agreement.

CHRISTINE MAINVILLE: Okay. Would you -- given the adaptations that you've just mentioned, would you say that the system, the Thales system that was delivered on this project, would you consider it a standard Thales system?

MICHAEL BURNS: Yes. I would say it -- it's a -- it's a standard system. There -- there was no -- the hardware was from existing systems that we had deployed elsewhere around the world.

CHRISTINE MAINVILLE: Was it a first for North America?

MICHAEL BURNS: No. There's been other systems in North America.

CHRISTINE MAINVILLE: By Thales.

MICHAEL BURNS: By Thales.

CHRISTINE MAINVILLE: Was it a first in other respects? For instance, was it the first time that Thales implemented a CBTC system on a low-floor LRV?

MICHAEL BURNS: I'm not aware of it being -- I can't tell you if there had been other

applications on a low-floor vehicle, and I don't -- I don't want to speculate.

CHRISTINE MAINVILLE: Okay. Are you able to say what the main adaptations were to Thales's standard system?

MICHAEL BURNS: The adaptations were reflections of the guideway and how -- the reaction from the -- the LRV, so we would be adapting software to respond to how the LRV intended to perform.

CHRISTINE MAINVILLE: And the LRVs were being procured from Alstom; correct?

MICHAEL BURNS: Correct.

CHRISTINE MAINVILLE: And was this the first time that Thales's systems interfaced with Alstom LRVs?

MICHAEL BURNS: I am -- if I can -- I'm not sure of the history, given I started with Thales at that time. I know Alstom and Thales have been involved in other products, but the first is likely that the Alstom LRV was the first North American derivative from their European Citadis design.

CHRISTINE MAINVILLE: Right.

MICHAEL BURNS: So in summary, the LRV

for Ottawa, from Alstom, it was its -- it was the first that Alstom was designing for their North America market.

CHRISTINE MAINVILLE: Right. And were you familiar with the base model, which was the Citadis Spirit?

MICHAEL BURNS: I'm not familiar with the base model of the Citadis Spirit.

CHRISTINE MAINVILLE: Okay. Do you understand that -- well, can you explain your understanding that this was a first for North America? Was this not originally a model that Alstom had used elsewhere, particularly in Europe?

MICHAEL BURNS: My understanding from Alstom, in our early meetings with Alstom in early 2013, was they were taking the Citadis Spirit design as its platform but had to do modifications to that design to comply with North American standards. That's like taking anything that has been designed in a different jurisdiction, and you have different standards you need to meet, even different hardware.

CHRISTINE MAINVILLE: And do you know if the modifications also had to do with the particular requirements for this specific project

as opposed to North American standards more broadly?

MICHAEL BURNS: Could you repeat that question again?

CHRISTINE MAINVILLE: Do you know if the design for the Ottawa project and the fact that, as you described it, it was a first in North America for Alstom, did part of the redesign have to do with the particular requirements that the City had in respect of this project as opposed to being the result of having to adapt to North American standards generally?

MICHAEL BURNS: That -- that's -- that would be beyond Thales's understanding and influence.

CHRISTINE MAINVILLE: Okay. Do you have a view as to, you know, what the implications might be of the fact that this was effectively a -- the first time this particular model was used?

MICHAEL BURNS: The impact as it relates to Thales in that Thales had an -- was an integral interface to the LRV was that there were many delays in finalizing the interfaces to the train, interfaces from just the physical space where our equipment could be accommodated within

the train, where our peripheral equipment would be housed, and electrically what communications we needed from -- details from Alstom and, conversely, what Alstom needed from Thales to complete the -- the message communication between the two systems, from the two companies.

CHRISTINE MAINVILLE: And was this something that was anticipated early on and provided for in the planning stages?

MICHAEL BURNS: Anticipated by whom?

CHRISTINE MAINVILLE: Well, first, maybe you could speak to Thales's expectations -- yeah.

MICHAEL BURNS: Thales understood that it was a critical interface that needed to be resolved quickly because there were schedule commitments for the production of the first onboard computer systems that we'd be providing. There was also schedule conditions for the provision of the first two prototype trains from Alstom.

CHRISTINE MAINVILLE: And could you tell us briefly or generally what was provided for in Thales's subcontract with OLRTC about when it was to deliver the VOBC racks?

MICHAEL BURNS: I recall it was

supposed to be -- I would say fourth quarter of 2014.

CHRISTINE MAINVILLE: Okay. Was that for the first one?

MICHAEL BURNS: For the first two LRVs.

CHRISTINE MAINVILLE: Okay.

MICHAEL BURNS: In that time period.

CHRISTINE MAINVILLE: Okay. And what about prior to that? I understand -- well, maybe you could first describe the process planned for in terms of how to go about devising this interface with Alstom's LRVs.

MICHAEL BURNS: Well, the design -- or -- let me step back. The Thales project agreement included three progressive design reviews of which the trains would be a component of, not its entirety: the -- a conceptual design review in June of 2013, followed by a preliminary review in September of 2013, and then a final design review in September 2014. That encompasses all of Thales's deliverables. A subset of those design reviews would be the progressive development of the design -- our design with the LRV.

CHRISTINE MAINVILLE: So the contract essentially provided for an iterative process to

this design interface.

MICHAEL BURNS: Correct.

CHRISTINE MAINVILLE: And did you come to understand what -- whether those corresponded to Alstom's deliverables?

MICHAEL BURNS: I can't answer what Alstom's deliverables are because I don't have access, nor should I, to the contract or the deliverable milestones within Alstom's agreement.

CHRISTINE MAINVILLE: Do you know whether there was any early thought put into the integration of the two systems from the two companies?

MICHAEL BURNS: I -- I believe Thales had a clear understanding of what had to be done to achieve that integration. Alstom demonstrated some reluctance in sharing the information we were requesting. Some examples where agreements were reached on how the signalling -- sorry, by "signalling," I mean the communication between the two systems, what is referred to as an IO signal diagram, so the in and out - 'I' being in and 'O' being out. So there's multiple communication channels, and Thales needs to understand and Alstom needs to appreciate what messages we are sending to

the train, and we need to understand what messages are coming from the train. That IO signal diagram was the topic of many meetings - I would probably say countless workshops - to try and resolve the needs of the two parties. Some -- some of the agreements reached in prior meetings were then changed in subsequent meetings.

CHRISTINE MAINVILLE: Okay. And we'll come back to those workshops, but at the earlier planning stages, design stages, what, if any, discussions were had between Alstom and Thales involving OLRTC regarding how that interface would be managed?

MICHAEL BURNS: I -- there wasn't a lot of overt discussion of managing the development of those interfaces. OLRTC participated -- or attended is a correct -- an apt description. They attended these meetings, but Thales and Alstom were left to work out those requirements and those interface controls between the two parties.

CHRISTINE MAINVILLE: And so was there any plan as to who was to -- who, if anyone, was to oversee this integration?

MICHAEL BURNS: As the prime contractor, OLRTC had the role of system integrator

within -- within the contract. They struggled to assign a resource or a group to fulfill that role of system integrator.

CHRISTINE MAINVILLE: Can you speak a bit more about that, what was conveyed to you in terms of the efforts that were made in that regard or what the plan was?

MICHAEL BURNS: My understanding was that the plan was that one group within the consortium, SNC Lavalin, was to provide that system integrator role out of the Vancouver office. That -- that same office had the responsibility for designing the tunnel ventilation system, but -- they did design the tunnel ventilation system, but they -- they were not involved and -- and did not fulfill or execute a system integration capacity.

CHRISTINE MAINVILLE: Were any reasons given to you about why that was?

MICHAEL BURNS: No. I repeatedly raised the concern with OLRTC. At one point, they did acknowledge they had a problem in fulfilling that role. But that was in 2017.

FRASER HARLAND: Can I just jump in there and ask a question? Can you just help us with what the -- the impact, from your perspective

or from Thales's perspective, of not having a system integrator was on the project?

MICHAEL BURNS: The -- the impact is the parties that OLRTC contracted with, there's a -- there's always some interface between each other, and in some cases more than each other. There could be three or more parties. Initially, the system integrator needs to be able to reconcile the overall project agreement requirements as being met by the work that they have subcontracted out to different entities. They -- the impact on not having that system integrator, it -- it defaulted to the subcontractors, like Thales or Alstom or others, to try and resolve conflicts by -- of how the systems were going to meet the OLRTC's project agreement requirements.

So you're -- if we're -- if I use the Alstom/Thales example specifically is we can -- we can solve a problem by one path through Thales or another path through Alstom, and who -- who is going to be the -- the entity that's going to resolve the -- the issue. And that requires an overarching management, which is the system integrator.

FRASER HARLAND: Just to follow up on

that, do you have any sense of why there was this lack of a systems integrator, from your understanding? Was there a resources issue, a policy choice made, or -- if you can help us at all there, that would be great.

MICHAEL BURNS: I was -- I was never told why. I can only offer what I saw in terms of how it affected Thales's performance, and verbally, it was -- it was explained to me that they were having problems fulfilling that role. I don't know if it was a human resource problem, whether they overcommitted to do other projects. This is -- this is pure speculation. I -- I just don't know, so I really can't answer the why. But it was -- it was made abundantly clear by me to OLRTC that this was a critical problem.

CHRISTINE MAINVILLE: And who specifically? Who was your main counterpart or counterparts on that?

MICHAEL BURNS: It would depend on the -- on which year you're talking about. But I had discussed this with Eugene Creamer, and I think Eugene came on as the lead project director in 2017. Prior to that, my main commercial interface was Alex Turner.

CHRISTINE MAINVILLE: Okay. And -- yes. And did they understand the issue? Did they appear to understand the issue?

MICHAEL BURNS: Eugene definitely understood it was a problem. Alex Turner, in his role -- his title was contract manager for the -- for vehicle and signalling, so as it was initially offered to Thales that Alex was going to fulfill that role of system integrator, but he didn't have the requisite background to be able to fulfill that role.

CHRISTINE MAINVILLE: Do you know whether they kept looking, OLRTC kept looking for someone to --

MICHAEL BURNS: Yes.

CHRISTINE MAINVILLE: -- properly --

MICHAEL BURNS: Yes, they did, and they brought on other engineering resources that fulfilled some aspects of that integration role.

CHRISTINE MAINVILLE: Was there an MOU or some other mechanism put in place to facilitate the collaboration between Alstom and Thales on -- on the interface?

MICHAEL BURNS: Sorry, what was the acronym you used? 'M' --

CHRISTINE MAINVILLE: A memorandum of understanding.

MICHAEL BURNS: Oh, MOU, okay. No, there was no MOU developed.

CHRISTINE MAINVILLE: And so how -- was there anything that defined your -- Thales's relationship with Alstom?

MICHAEL BURNS: Within the agreement itself, there -- I don't recall that there was a specific mechanism detailed, how the two parties would work together. They -- the two parties understood there had to be that collaboration, and that started immediately, in, you know, early 2013. It's the product or the output of those meetings, some of which were minuted, some of them were more informal. The -- what you might -- what you refer to as a memorandum of understanding or an agreement would be the product of what Thales produced, which was interface control document that defines -- well, there's two documents specifically. There's a -- what we referred to as a black box interface which defines the mechanical, electrical aspects of what Thales is producing, and then the other interface is more the electrical, of the signalling components of what messages we're sending to the

train, what messages we're receiving and vice versa. So I referred to earlier about the IO signal diagram. That's a key component of that ICD.

CHRISTINE MAINVILLE: Is there a distinction between the ICD you just described and the -- well, let me put it this way: Is the ICD a mechanism to arrive at a finalized -- at finalized CBTC specifications?

MICHAEL BURNS: The ICD is -- serves two purposes. The first purpose is internally, it provides the engineering details necessary for Thales's software development, and then mechanically, on the black box interface, it provides details about how our equipment would be installed within that vehicle. So that -- it's a -- it's a document for, internal, Thales's project execution, and externally, Alstom and OLRTC then know what we are going to do and how the Alstom equivalent interface has to mirror the same.

CHRISTINE MAINVILLE: And were you receiving ICDs back from Alstom in terms of what their own design requests --

MICHAEL BURNS: Yes.

CHRISTINE MAINVILLE: -- required?

MICHAEL BURNS: As part of that iterative interface development, we did receive some versions of an equivalent ICD from Alstom, and that would have been produced as a product of the workshops or interface meetings we had with Alstom.

CHRISTINE MAINVILLE: And so how did the integration of those respective ICDs, the ones from Alstom and Thales, how did that ultimately get done?

MICHAEL BURNS: The -- we provided the -- our ICDs to OLRTC, and Alstom provided their ICDs to OLRTC as well, and then we would compare -- as I said, this iterative process, we would compare what we received from Alstom to what we had discussed and our understanding coming out of the workshops and identify if there were any discrepancies or errors, and in more than one occasion, there were reversals of ICD decisions that were made with Alstom when it -- the ICDs were I believe developed in France. Our interface with Alstom was a representative in -- out of Toronto, and he would convey those -- the workshop interface decisions back to France and then they -- the -- I guess the Alstom France owned the -- the ICD documents, and they would make the updates in

France.

CHRISTINE MAINVILLE: Would you have expected this process to -- to be different had there been a -- a systems integrator in place early on?

MICHAEL BURNS: Yes, but I don't believe it is the sole complication that we faced. We -- you have to appreciate that Alstom is a competitor to Thales, and that might explain their reticence of providing information to Thales. But definitely a system integrator would have facilitated that integration activity or the development of the interfaces much faster, in my opinion.

CHRISTINE MAINVILLE: So was it an issue that Thales's system was to be integrated with Alstom LRVs in the first place?

MICHAEL BURNS: In terms of the relationship between Alstom and Thales? No.

CHRISTINE MAINVILLE: Well, it's -- no?

MICHAEL BURNS: No. I -- it's a -- my understanding was Alstom and Thales had different discussions before the contract award, so there -- the parties knew that there was the potential that they would be working together, so that should not

have resulted in a problem.

CHRISTINE MAINVILLE: And is it the case that Thales's systems often interface with LRVs produced by other companies?

MICHAEL BURNS: Yes.

CHRISTINE MAINVILLE: And you've spoken about this issue of Alstom being a competitor. Does that issue not arise generally, then, on other projects?

MICHAEL BURNS: Yes. Because Thales is not a rolling stock manufacturer, they have to interface with whomever is the rolling stock provider, the train provider. So we're used to what's required to develop interfaces with other -- other trains. So -- I don't know if that answers your question.

CHRISTINE MAINVILLE: You're used to it, but are there similar challenges, then, in terms of receiving the information that Thales needs for the interface?

MICHAEL BURNS: I can't speak to historical experiences since I -- I don't have that. I don't expect that -- I expect there's always going to be a -- a challenge in trying to come up with an agreeable fit within the train

and -- and what each train might need in the way of communication and what Thales needs, conversely, from the train. But it should not have been as protracted as our experience, in my opinion.

CHRISTINE MAINVILLE: Would you agree that as a result of this being the first interface between Thales's system and this particular LRV model that there was a heightened need for strong interfacing management?

MICHAEL BURNS: I would say that that's a need, in my experience, in complex integration activities. You always need a very strong integrator.

CHRISTINE MAINVILLE: And to be clear, this project never did have one, as it related to the Alstom/Thales interface; correct?

MICHAEL BURNS: That is correct.

FRASER HARLAND: Just related to that, can I ask, was that -- I mean, was that the expectation of -- what was the expectation of Thales prior to the contract being signed with respect to system integration?

MICHAEL BURNS: I can only report what our contract specifies, and it specifies that OLRTC would fulfill the role of system integrator.

CHRISTINE MAINVILLE: Are you aware that Alstom's subcontract with OLRTC required OLRTC to deliver to Alstom a finalized CBTC specification by April 26th, 2013?

MICHAEL BURNS: I am, because that was repeatedly mentioned by the Alstom vice president, Derek Hurst, on the very first meetings with OLRTC and Thales.

CHRISTINE MAINVILLE: And was this -- I take it the CBTC specifications needed to come from Thales; correct?

MICHAEL BURNS: The specifications from the CBTC system? Is that --

CHRISTINE MAINVILLE: Yes.

MICHAEL BURNS: Yes.

CHRISTINE MAINVILLE: And so was that -- given the iterative process you've described, was that a realistic timeline for Alstom to receive those specifications?

MICHAEL BURNS: Well, I believe the specification you're referring to was provided by Thales very early, like within the first month or two.

CHRISTINE MAINVILLE: Were these finalized, though, in terms of being frozen in

time?

MICHAEL BURNS: The -- you're -- I'm not sure if there's a disconnect in the interpretation of what Thales was initially providing and what Alstom's contract specified they would get. So it's difficult for me to give you an answer. We definitely provided the requirements that Thales needed because that was known. It's the adaptation of what we needed and the -- and that adaptation vis-à-vis the train itself is what was the protracted interface development.

CHRISTINE MAINVILLE: And is it accurate to describe what Thales delivered to Alstom in April 2013 as the IC -- a draft ICD or a version of the ICD? An early version?

MICHAEL BURNS: I don't recall. I know there was a -- definitely a document that defined our requirements. I don't know if that would have been interpreted or deemed to be a draft or first version of an ICD.

CHRISTINE MAINVILLE: But there were subsequent revisions to the Thales ICD; correct? From April 2013 onwards?

MICHAEL BURNS: No. I'm going to correct your question.

CHRISTINE MAINVILLE: Sure.

MICHAEL BURNS: Because what was provided in April by Thales may not have been an ICD.

CHRISTINE MAINVILLE: Okay.

MICHAEL BURNS: And so once the ICD -- the first version of the ICD, I would have to refer back to our records to understand if it was, in fact, Revision 1 of the ICD back in April.

CHRISTINE MAINVILLE: Do you recall whether Thales had committed to providing a fully defined ICD in the first half of September 2013?

MICHAEL BURNS: No, I don't recall that. I don't recall that there was that commitment. As I mentioned earlier, the final design review was September of 2014. So the -- the -- the development of those interfaces should have been concluded no later than at final design review.

CHRISTINE MAINVILLE: Did you come to understand what Alstom's expectations were and whether they aligned with Thales's expectations in terms of that timeline?

MICHAEL BURNS: Expectations of the timeline or expectations of the ICD?

CHRISTINE MAINVILLE: Right, both, in terms of what it would receive when.

MICHAEL BURNS: We -- we regularly communicated with Alstom's contact, Lowell Goudge, about our deliverables and when they would be submitted. So they -- they were definitely aware of what we were doing and when the next update would be provided.

CHRISTINE MAINVILLE: But did they express concern about that or --

MICHAEL BURNS: I never experienced with Alstom a concern about finalizing the ICD. There -- I could speculate that they may have had other challenges that could be hidden by the continuation of ICD update revisions. They were taking this train and -- from Europe and having to design it to meet North American requirements, and I know they struggled with a number of issues on that front. There was a number of changes of where the trains were going to be manufactured, where they were going to be tested, and that may have been a product of delays in -- in completing their train design.

CHRISTINE MAINVILLE: Right. So speaking to that, could you explain what was the

original plan in terms of where the train manufacturing was going to take place.

MICHAEL BURNS: The first two trains were to be manufactured in France, and they were to be delivered prototypes - they were to be tested in France before - and the balance of the trains were to be assembled in Ottawa.

CHRISTINE MAINVILLE: And then what happened?

MICHAEL BURNS: There was a change so that the first trains were then being assembled in their facility in New York State, and because the trains were not in France, we were unable to execute our test -- the planned testing of the trains with the first of our onboard systems, and the schedule -- the initial schedule and -- and per the contract, we were to execute that testing of the mechanical and electrical performance of our systems on the train and do the first of the what we'll call ASC testing, automatic speed control testing, where we are able to assess the train's reaction to our commands, and that's a variable that needs to be developed into our software - again, the adaptation performance - so that was -- that was not achieved in France because the trains

never were finally assembled in France but were assembled in New York, and the New York facility didn't have the test track that would allow us to be able to do the dynamic testing of the trains.

CHRISTINE MAINVILLE: So was that testing ever done on the first two LRVs?

MICHAEL BURNS: No. The first -- the first train that we were given access to was train number 5. We had to -- they -- we had to postpone the automatic ASC testing until much later, and that -- the results of that testing being -- were -- were pushed back such that it impacted our software development. So as you move through the design, software development, and testing, pushing off certain functions from testing leads -- leads to a protraction of the overall timeline for our testing.

CHRISTINE MAINVILLE: It led to additional complexities down the line which could have been streamlined. Is that --

MICHAEL BURNS: That's a fair summary.

CHRISTINE MAINVILLE: And was that considered when the move was made -- the decision was made to move the assembly from France to New York State? Do you know whether that was

considered and discussed, the fact that this testing would not be performed by Thales?

MICHAEL BURNS: My recollection is that that -- we weren't asked to comment or offer an opinion. It was more of a notification that this is where the trains would be going to.

CHRISTINE MAINVILLE: Do you know what led to that change?

MICHAEL BURNS: No, I don't. I do not know -- I -- anything I could offer would be just speculation.

CHRISTINE MAINVILLE: Okay. And did Thales raise this issue with OLRTC upon being apprised of the move?

MICHAEL BURNS: I recall that I had raised this likely in my monthly report at the time.

CHRISTINE MAINVILLE: Was there a response back by OLRTC?

MICHAEL BURNS: I -- I do not recall.

CHRISTINE MAINVILLE: And do you recall approximately the time frame for when Thales was able to perform this test for the first time on LR 5?

MICHAEL BURNS: No, I don't recall, but

it would be no earlier than 2017 and likely probably into early 2018.

CHRISTINE MAINVILLE: So this would have had a significant impact on the delivery timelines. Is that fair?

MICHAEL BURNS: It would have had an impact on the completion of our testing, site testing.

CHRISTINE MAINVILLE: Did that have other repercussions on subsequent testing?

MICHAEL BURNS: Well, again, the iterative nature particularly of ASC testing is as you're testing the performance of the train, you -- there's tuning that needs to be made on -- on our software, so it would have involved more software build releases so there would be time to develop, validate the software, and then issue for uploading on the system. So it led to -- it's one of the sources for the prolongation of testing.

CHRISTINE MAINVILLE: And I'll come back to testing, but do you -- I understand there was an issue that arose regarding whether the system, Thales's system, was to be delivered as a complete signal rack as opposed to in -- broken up into components, so whether it would be a

plug-and-play system or not.

MICHAEL BURNS: Alstom had expressed that opinion to Thales. I had to explain to Alstom that our offer - and it was part of the artifacts in the -- our subcontract agreement - identified the VOBC as a -- as a single-rack assembly. That -- the comment from Alstom was a surprise to our engineering team.

CHRISTINE MAINVILLE: Should this have been --

MICHAEL BURNS: They also expected that the VOBC would -- would be fully integrated and wired so that it was -- they -- as you -- and they used the same term, that is was just plug in or plug-and-play system.

CHRISTINE MAINVILLE: And do you recall when -- around when that came to Thales's attention, that Alstom had this expectation?

MICHAEL BURNS: It was in 2013.

CHRISTINE MAINVILLE: And was it resolved around that time?

MICHAEL BURNS: The resolution -- well, there was no -- no, sorry. I have to regroup on this. Thales was very clear on the expectations as defined within our agreement. Alstom did not

accept or reject it directly. Indirectly, and subsequent to this view of what they expected from Thales, they offered a variety of obstructions: wanting the rack to be located in various locations, under a heat source; they wanted it mounted from the ceiling; they also wanted it removed from the cabin and put on its side in the roof, as a number of the feedbacks that we got and proposed changes to where we would physically have the equipment.

CHRISTINE MAINVILLE: And I understand that that had more to do with the dimensions of the rack.

MICHAEL BURNS: Yeah, and the -- well, the dimensions of the rack were -- were known before the contract. It was the space that Alstom deemed available to Thales, so we -- we looked at alternate locations, either in the cab or behind the cab, even locations of where we would put the -- the operating display, and they were generally met with a rejection, that that space was -- was not available, that they had already allocated the space for their own systems.

CHRISTINE MAINVILLE: Okay. But in terms of how the rack would be delivered more

specifically, I understand that there were to be a number of wires, for instance, to be connected within Thales's equipment upon delivery.

MICHAEL BURNS: Right.

CHRISTINE MAINVILLE: And was there a reason those would not be connected prior to delivery?

MICHAEL BURNS: The agreement was that -- within the work share that was broken out in our agreement of -- Alstom was responsible for some things, and Thales was for others, and it was very -- it was -- it was broken up, to my view. There wasn't a clear, natural demarcation of who should do what and then hand over a complete unit to the other. So having it unnaturally divided would create conflicts or misunderstandings. The way we were responsible for was the first two, the two deliverable prototypes, we would prewire the -- with all the final connecting pieces that would interface to the train, either on the -- their -- either a direct train line or MVB connection, a multibus connection. So it's difficult to deliver that if there's still discussions about the ICD. But how that specifically got resolved was that OLRTC recognized that there was a gap in that work

share because it only addressed the first two VOBC systems, so they then funded us to complete the prewiring of the racks for the balance of the -- the VOBC systems.

CHRISTINE MAINVILLE: Okay. So we hear Thales did eventually provide the personnel to assemble and test the rack, and was that at the point of installation?

MICHAEL BURNS: No, it -- that was done prior to installation. If you -- the VOBC -- the subassemblies within -- the major subassemblies within that are factory-tested and certified, and they are -- they slide into the rack, and beyond the first article tests where we had the complete VOBC rack and populated and wired, the -- the Thales approach was that because these modules are interchangeable, they're not tested and -- and fixed to that particular train, from a maintainability, you have to be able to swap them out with spare or move them between different VOBCs.

So the way we explained it to OLRTC was we prewire the rack and validate that they -- all the connections are there, and we ship the rack without populating the heavy modules because of the

risk of physical distortion of the rack because of the weight of all these interchangeable modules. So we deliver a wired rack, ready to accept all these modules that slide in, and then after that is installed, then there's the connections that are made to the -- to the train.

CHRISTINE MAINVILLE: So did Alstom only end up making those connections between the rack and the train?

MICHAEL BURNS: That -- that was within Alstom's responsibility of taking the -- taking the wired rack, mounting it into the train cab, populating those modules, and then terminating the connections at a common connector mounting point at the base of the rack.

CHRISTINE MAINVILLE: And who ended up doing the SPICO testing on the connections within the VOBC rack?

MICHAEL BURNS: Well, there was a dispute about that as well, again I think tied back to this unnatural division of responsibilities. Thales provided the SPICO procedures, so -- by -- SPICO being static post-installation checkout. So there's no power to it. Nothing is moving. Alstom had responsibility to perform the SPICO tests, and

then after those tests were passed successfully and the results shared with Thales, Thales would then take it to the next level, which is to do dynamic testing of the completed assembly.

By that -- by the SPICO test procedure, everything is in, installed, and we know that all the connections to the train are successful, and then we do another series of dynamic testing where there became an issue is in part by where the connections were made inside the Thales rack. Alstom refused to do some of the SPICO tests because it involved going inside the envelope of the VOBC. So OLRTC was forced, because of Alstom's refusal, to request Thales undertake a subset of the SPICO tests.

CHRISTINE MAINVILLE: So that's what ultimately happened, that Thales performed --

MICHAEL BURNS: Some of the SPICO tests the Alstom was under contract to perform.

CHRISTINE MAINVILLE: And did Thales perform all of the SPICO testing that Alstom objected to performing?

MICHAEL BURNS: Yes.

CHRISTINE MAINVILLE: And so was -- was the entire testing done, ultimately, the SPICO

testing?

MICHAEL BURNS: Yes, it -- the -- regardless of who performs the test, Thales will not, cannot perform dynamic testing because you're taking the train onto the track, and you're going up the track with it. So it's a precondition that the SPICO test must be successfully completed, regardless of who performs it, and it's only after that is done that we are allowed to undertake the dynamic testing.

CHRISTINE MAINVILLE: And just (indiscernible), did Thales end up doing more SPICO testing than just testing the battery and low-voltage hardware interface?

MICHAEL BURNS: I don't know the specific descriptions of the SPICO tests we performed. I can only say that we didn't perform any extra tests that we hadn't previously instructed. We just did the tests that Alstom refused to do, if that answers your question.

CHRISTINE MAINVILLE: Yes. You spoke about this unnatural division of responsibility, so can you be a bit clearer on that? What was provided for initially was not what you would expect? Is that what you mean?

MICHAEL BURNS: Well, it was -- when I first met with OLRTC - so that was in probably May, early May of 2013 - I was asked what my initial thoughts were on the agreement and what -- what might keep me up at night. And my opinion, new to the industry but not new to managing complex projects, was you have too many interfaces, and each interface is an opportunity for a misunderstanding of what one party is expecting and a misunderstanding of what the other party receives. It's -- it's a -- it's akin to a translation service: You need -- you -- every time there is a handoff or an interface, there is misunderstandings or a misinterpretation that could arise.

And so I expressed that to OLRTC very early. It's not something that I expected them to change, but it was in response to that, you know, question of what -- what would keep me up at night, and the interface between -- or the work share between Alstom and Thales as it specifically related to interfacing the onboard equipment onto the Alstom vehicle was a perfect example of that.

CHRISTINE MAINVILLE: It's fair to say there should have been more thought put into that

interface at the design stage?

MICHAEL BURNS: No. It was baked into the agreement. So in a perfect world -- and I don't understand the logic at the time. I could only speculate it was based on money -- was that since Alstom's going to be assembling the train, why not get them to assemble the onboard equipment that we're providing at the same time? I'm assuming the logic may have been it would be cheaper to have Alstom take on that work than to make it a more of a turnkey installation of all the Thales systems. You know, we -- a cleaner interface would have been, You build the trains, Alstom, and when you're finished building it and doing whatever testing you need to do and you're ready for the VOBC system, then Thales will come and take care of the installation of that. And then you have to agree to where it's going to go and all of that, but there wouldn't be debate about who's going to put a -- a screwdriver into the rack assembly and -- and tighten this up.

CHRISTINE MAINVILLE: Right.

FRASER HARLAND: Just to be abundantly clear, when you talk about this unnatural division of responsibility in the agreement, you're

referring to the subcontract between Thales and OLRTC; is that right?

MICHAEL BURNS: Correct. It's -- it's -- there's a table in our subcontract agreement called work share. It's a -- it may be a separate schedule. And in it, it shows the different tasks and who does what, and it's a -- if you look at it, you can see Alstom throughout or you can see Thales throughout. So there's little bits that each of the two parties are responsible for, to either deliver materials, install materials, and test materials.

In a perfect world, the parties would have understood each other and would have been -- maybe understood better what was going to be required, but as we've discussed earlier, Alstom claimed to have an expectation very different than what Thales had offered and our subcontract agreement provided.

So I -- I can't speak to Alstom's motivation of why they may have had that expectation, but that's -- it's an example of the -- those expectations or misunderstandings may not have arisen had there been a clearer demarcation between the scope of one subcontractor

and the other. And the best world would -- you'd have, you know, Alstom subcontract and Thales subcontract and a single interface, one cable between the two, as a graphic explanation.

CHRISTINE MAINVILLE: Right. And Alstom's requirements were not known to Thales. Is that fair?

MICHAEL BURNS: Alstom's requirements. Alstom's --

CHRISTINE MAINVILLE: In their contract. In their contract and what they had to provide.

MICHAEL BURNS: I have to assume that the same work -- work share schedule is in the Alstom agreement and in the Thales agreement. It -- it had to have been. But I cannot -- I haven't seen the Alstom agreement, so I can only -- by the discussion and efforts, it's definitely there because we did have discussions about who should do what and who should -- who should define the type of connector that we were terminating to. And in that -- that work share agreement, that responsibility was given to Alstom, so therefore they dictated the connector, the mating connector to their train.

CHRISTINE MAINVILLE: Would you say that Alstom's ICDs and Thales's ICDs never fully spoke to each other?

MICHAEL BURNS: That's a very true assessment.

CHRISTINE MAINVILLE: And can you talk about why there was never -- why a full integration of those ICDs was not achieved?

MICHAEL BURNS: I can explain it in -- with a -- an example, if you permit. Where we -- we -- we meet, our engineer's present, and we walk through the IO signal diagram and explain what command this is going to and what reaction is expected, and -- and it's an iterative review with the Alstom representative, and there's an agreement, and it's minuted, and then, because Alstom has the same needs as Thales, these ICDs go back to homeroom, and it's used for software development or for their development of the trains and -- or their software.

So Alstom isn't going to issue internally a Thales document to fulfill the same, and conversely, Thales isn't going to issue to our software group an Alstom document that describes the interface. They're each -- each entity is used

to its own processes and procedures. So Alstom and Thales needed to generate identical ICDs to reflect the agreements that were reached at meetings.

Once we thought we had a full agreement, the requests went back to Alstom France to update their ICD, and what came back was completely different. It was -- it reflected what appeared to be a -- generic Alstom signalling interfaces. It was as if Thales was not -- a Thales signalling system had been removed and an Alstom signalling system had been replaced.

So I don't know if that was meant to be frustrating or just an oversight or the wrong individuals in France given the responsibility for updating their ICD, but it's an example of we put the effort in, we thought we had an agreement -- well, we did have an agreement, but it wasn't reflected in the documents that came back. And there was a lag between coming to a workshop agreement and then getting an artifact that validates that we both have the same understanding.

Another example is -- and it happened more than once, where Alstom added new requirements into their ICD and provided what should have been validation of what we had agreed at the previous

meetings. But you find new things, new requirements that have not been discussed but included in an ICD release. So why that would happen, it could be they were learning things as they were designing the -- the LRV, or they were trying to be obstructionist. And that's -- I'm speculating. I -- I'm not -- I'm not accusing them of that.

CHRISTINE MAINVILLE: And it's fair to say that had there been better planning for the systems integration early on, much of this confusion probably would have been avoided?

MICHAEL BURNS: Yes. Now, I did mention, I think, that they -- this -- the role of a system integrator isn't just between Alstom and Thales. It's -- it's much broader. That's -- when I'm talking about system integrator, it's all the systems that make up the LRT network, the system that is operating today. What OLRTC did achieve is bringing in some people later on to help in finalizing the interfaces between Alstom and Thales. Jacques Bergeron was the name that comes to mind. He was somewhat effective, but a lot of what -- of the lost time or the -- the -- the issues between the two parties had already arisen.

CHRISTINE MAINVILLE: Do you recall about when he came onboard?

MICHAEL BURNS: Oh. No, I don't. I would say -- I'm speculating. It would be maybe 2015 for maybe a few years and then he retired.

CHRISTINE MAINVILLE: And the systems integrator role, would that be -- would that person be involved through design, construction, and testing?

MICHAEL BURNS: Absolutely.

CHRISTINE MAINVILLE: Did Thales interface at all with RTGEJV, the engineer -- engineering designers?

MICHAEL BURNS: The -- oh, the -- we interfaced with -- yes, with the Vancouver office of SNC Lavalin.

CHRISTINE MAINVILLE: Well, they have -- one of the members of the consortium is SNC but not -- I don't believe it's SNC Pacific which is part of OLRTC.

MICHAEL BURNS: Right. So I'm not sure --

CHRISTINE MAINVILLE: Okay.

MICHAEL BURNS: No, I'm not -- I'm not sure of who we're asking. We -- we interfaced with

a lot of people, and it's -- I'm not sure of their homeroom. I mean, we -- we interfaced with EllisDon on certain aspects. The -- the EJV that -- if you're thinking about it that did the design of -- the civil design of the LRT --

CHRISTINE MAINVILLE: Yes.

MICHAEL BURNS: -- or the infrastructure, we -- we received drawings of the guideway which we needed to be able to complete our software design. It's a -- it's -- probably the best example of application software development is we -- we need -- we need to know where the -- where the track is, the elevation changes, and -- and that gets baked into the operating software that we deliver. So our interface, though, was the receipt of the design documents, not necessarily involved in an exchange of -- of design opinions.

CHRISTINE MAINVILLE: And you mentioned earlier in respect of the workshop meetings and other meetings as between Alstom and Thales that OLRTC attended, but can you speak a bit more to their level of participation in terms of assisting with the coordination?

MICHAEL BURNS: Well, they -- they coordinated a meeting. They attended the meeting,

but with the exception of Jacques Bergeron, while he was involved, they didn't fulfill an expectation of interpreting between the two parties, mediating maybe a -- not a dispute but how to -- how to resolve an interface or some issue. There's a number of examples - I can't recall off the top of my head - where we offered OLRTC a solution, but it would require us to change our software.

And conversely, Alstom could have changed their software to -- to resolve it, but, you know, someone was going to have to make a decision, and probably there was a cost associated with whatever decision was made, so that's fundamentally what the system integrator should be doing is making that determination of how to solve the issue and instructing the parties the path forward.

CHRISTINE MAINVILLE: And so what was done? How were those issues resolved, ultimately?

MICHAEL BURNS: Some issues -- well, there was -- what happened on the one example I can think of where it's -- Thales does as part of its safety sort of prelaunch test is we test that the emergency brake command, that we command the train to brake, actually responds, and we do this before

the train starts moving, so it's called a 3EB test. We weren't aware -- Alstom hadn't disclosed that they have a safety condition that if the train -- while it's operating and -- you know, operating at regular speed has a number of emergency brake commands within a short period of time, that they -- they stop the train. And it's -- it's for a good safety reason. But we're doing the same -- we're doing this test while the train is not moving, so there's not the same -- there's not a safety concern.

So Alstom could have put in a change in their software that said only if the train is moving would that -- that reaction be taken, and that would have solved the problem. It was not solved for a long time until OLRTC finally enforced us to modify our software as a condition of an extension of time settlement they had provided us. So they just added it in.

CHRISTINE MAINVILLE: And so it was these -- the resolution of any given issue was done on an ad hoc basis? Is that fair to say?

MICHAEL BURNS: That's a fair summation.

CHRISTINE MAINVILLE: And going back to

the fact that the ICDs don't fully speak to each other, could that have an impact on the performance or reliability of the system?

MICHAEL BURNS: Depending on what -- depending on what we don't know, there is that potential. There was one example where we -- we discovered that there was a reaction or that Alstom had made a connection to a door enable function that we were unaware of, and so under a particular scenario where the -- the door opens that -- or that -- where we enable the door to open, it closed prematurely, and -- on -- actually caught a woman's arm.

So we -- we did an investigation and found that there -- Alstom had -- had assigned a signal to a circuit that was vital to us and I guess attached another -- another command to that same signal, and so we were unaware of -- in that particular event of the command that the door would react as it did, where it didn't -- didn't remain open for the entire dwell. Like, when the train comes into a station, there's a dwell time where the door opens, and -- under normal circumstances, the door opens, and there's a period of time where then it -- it closes. And our expectation was --

and through the ICD was that Alstom has -- within the door edge, there's a sensor that if something blocks, like an arm blocks, that the safe reaction is that the doors immediately open, right, as a safety, to avoid that scenario.

So that was a behaviour that wasn't -- that wasn't shared in the ICD between Alstom and ourselves, but because of what we discovered through the investigation of the operational logs of what signal reaction had been, we then made -- made a modification of our -- our software to avoid that in the future, and that -- like, we didn't bother getting into a protracted debate about who should change what. We just made the change in our software to disable that -- that reaction.

CHRISTINE MAINVILLE: And so this, for instance, was not tested for because --

MICHAEL BURNS: Well, you wouldn't test it because you're not expecting that reaction. You're -- the -- you're -- the software testing is testing of the -- the behaviours the ICDs reflect.

CHRISTINE MAINVILLE: You can only test what's known to you is effectively what you're saying.

MICHAEL BURNS: You -- you -- you're

more articulate than I am.

CHRISTINE MAINVILLE: Would there be any value today still in conducting that exercise of their -- you know, of a full integration?

MICHAEL BURNS: I think from a level of maturity, I think -- and given that the system's been in operation for over 2 years, or coming up to 3 years -- no, 2 and a half years, that no, I don't think there would be -- and keep in mind I'm not an engineer.

CHRISTINE MAINVILLE: M-hm.

MICHAEL BURNS: I don't see there would be further value in reopening and -- and reinvestigating what -- what they -- that -- those interfaces are.

CHRISTINE MAINVILLE: Because there -- by this time, there should not be any more such surprises. Is that --

MICHAEL BURNS: Well, you -- you would think, after 2 and a half years, you -- you've gone through all possible scenarios of commands and behaviours of the train and -- and the operations so that they would have shaken out, I think, by now.

CHRISTINE MAINVILLE: Okay. And I just

want to go back to your indication that OLRTC was not able to find someone to perform the systems integrator role -- or properly or fully able to perform it. What's the source of your information on that? Who would have conveyed that to you?

MICHAEL BURNS: Directly, Eugene Creamer in 2017. I would have, prior to that, in early 2013, brought it up as a concern, and I guess the -- the executives of the consortium at that time. The senior project director was David White and Paul Tetreault. So we shared those concerns in our regular meetings in Ottawa.

CHRISTINE MAINVILLE: And --

THE WITNESS: So I would participate at those meetings, and then depending on the agenda, there would be other engineers or resources. Typically the project design authority attended all those meetings with me.

CHRISTINE MAINVILLE: Who is that?

MICHAEL BURNS: I'm sorry?

CHRISTINE MAINVILLE: Who is that? The project design authority?

MICHAEL BURNS: His name - and he still is the design authority - is Paul Dooyeweerd.

CHRISTINE MAINVILLE: And what was the

response back when you kept raising concerns about the -- fulfilling this system --

MICHAEL BURNS: I expressed it in terms of the implications on schedule, and my concern was that they were unable to complete a fully integrated schedule with all of these systems that they had procured, and therefore without being -- without having that integrated schedule of all the inputs from these subcontractors, you had no way of knowing when you would finish. Their schedule -- and I participated in a number of schedule workshops with them. It was civil design and construction-centric. So there wasn't an appreciation or they hadn't demonstrated in their schedule an appreciation of the weaving of deliverables or even inputs to deliverables from all of the subcontractors.

CHRISTINE MAINVILLE: And I was going to move on to all these delays in the schedule, but just before I do that, can I just be clear, they weren't able to find someone to fill the system integrator role, but by then, by 2017, Jacques Bergeron had come in, so was he just not -- as well-intentioned as he was, was he just not in a position to fully perform that role?

MICHAEL BURNS: I think he may have been capable, but his mandate was focussing on what was already apparent to the consortium was the trains being late and issues related to the vehicle. So his focus was vehicle.

CHRISTINE MAINVILLE: As opposed to the interface, you mean?

MICHAEL BURNS: As opposed to the interface. But by extension, Thales is drawn into anything that's related to vehicle, right?

CHRISTINE MAINVILLE: M-hm. And --

MICHAEL BURNS: You -- you -- you -- I don't think it's clear in your mind.

CHRISTINE MAINVILLE: Well, I'm wondering whether effectively what you're saying is by the time he came around, it was too late to -- to do a proper systems integration or because there were other distractions and issues to resolve.

MICHAEL BURNS: Well, ideally you -- you map out at the very beginning how you're going to integrate all of these systems together and then develop that timeline, and you -- and in that initial timeline development, you will identify where you have problems, where you have constraints or risks for not making your ultimate goal of -- of

May 2018, and then you -- then you work around a plan of how you're going to address it. That's -- that's how it should be, regardless of the industry. And I think by the time Jacques was brought in, he was probably -- his role was, I think, largely trying to bring forward the Alstom schedule. And he came from Bombardier, so he was very familiar with trains.

CHRISTINE MAINVILLE: M-hm. So in terms of schedule delays, first can you speak to the impact, if any, of the infrastructure delay or the civil work delays on Thales's work?

MICHAEL BURNS: Well, it -- yes. The schedule was to commission the yard first, but there was a lot of delays in completing the design and -- what was visible to me is the construction. It was late. And OLRTC was responsible not only for the construction but installing a lot of -- well, all of Thales's equipment that we were providing that wasn't going on a train. They -- they installed that, so another -- another unnatural division of work. But -- that was late, so that meant we couldn't start our testing, and there's a -- probably it wasn't until Eugene Creamer was brought in to try and recover or accelerate

testing in 2017 did we see an acknowledgement that they were in -- they had a serious problem.

So we -- we need a lot of time to test. We have to test the trains, we have to test our software by the various -- segmented by zones, and as the -- our testing will -- will require -- we'll discover things during testing that will require us to modify software to react to the real-world environment, because our -- our base software, it takes into account the guideway I mentioned earlier, so we know where the trains are going, we know the -- the track layout - you know, the peaks and valleys - we're given speed limits that we can perform. We've got speed performance inputs from the train itself, but it's not until we start testing where there's nuances in the real world that materialize.

Prior to that, it's -- it's tested in our lab. So it's a lab environment that validates that it -- it should perform as -- as designed, and it will perform as designed, but it's -- it's the real-world discoveries that are made that require us to do some -- some modification to our software to reflect.

So what I'm saying is our test time

is -- is -- is protracted, and it needed a good portion of time, but it -- because of our -- where we fit in the -- the cycle, OLRTC consumed a lot of the -- the timeline, leaving very little time for Thales to perform its tests.

CHRISTINE MAINVILLE: And is that -- was that a concern to Thales, the compressed timelines?

MICHAEL BURNS: Oh, absolutely.

CHRISTINE MAINVILLE: How would you say that impacted, ultimately, the testing that was done and the implications of it?

MICHAEL BURNS: By -- well, do you mean did we minimize our testing?

CHRISTINE MAINVILLE: Did -- yes, or did you ultimately get enough time to do the testing you would have wanted to do?

MICHAEL BURNS: Well, our test time is -- is not really subject to a tolerance of whether I have available time. There's -- there's very strict safety conditions that are placed on -- on the system, and we have to satisfy -- internally, we satisfy our internal testing before it ever gets released to the field and installed, and then we have to conduct all the tests to

satisfy it meets all our safety conditions, and then that gets -- all of those results have to be internally reviewed, and it's only after that is satisfied by our safety committee do we authorize safety certification.

CHRISTINE MAINVILLE: M-hm.

MICHAEL BURNS: So there's no shortcuts other than what was -- and it's not a shortcut. I should choose my words better. And one of Eugene Creamer's early moves was to seek an acceleration of our testing, and they had -- he had recognized that they weren't going to make their May 2018 date, but he wanted to mitigate that -- the amount of prolongation of testing. So he funded Thales to put a second test team in Ottawa so that we -- we had not just a single test team doing the testing during the day but some tests could be done off hours or for a -- in the course of a week, you'd get more tests done. So that's -- that was one approach that OLRTC took to try to mitigate the delays.

CHRISTINE MAINVILLE: And I understand all the necessary testing was done, but would Thales, in a perfect world, would it have wanted to do more or different or additional testing?

MICHAEL BURNS: No. No. It's -- it's -- there's -- these are absolutes.

CHRISTINE MAINVILLE: And were there changes made to what -- to the testing requirements as it relates to Thales's testing?

MICHAEL BURNS: I don't know if I can answer that question. I'm not -- I'm not sure what you're -- where you're going.

CHRISTINE MAINVILLE: Well, in terms of what the initial testing criteria were, were there any changes along the way to those criteria as it related to Thales's work or system?

MICHAEL BURNS: I'm sure as testing evolved, and maybe there was interfaces that were conveyed to Thales, we had to adapt or add more tests. I'm thinking specifically the SCADA system or the -- the passenger information announcement system. There may have been something that -- because they -- they came on later in the project timeline, so there may have been additional tests that were added. But I'm not really the right person to ask.

CHRISTINE MAINVILLE: Okay. And just to be clear on what we're talking about in terms of the testing, are you referencing the dynamic PICO

testing or more broadly Thales's tests?

MICHAEL BURNS: I -- there's -- I would say more broadly the Thales tests. The -- and maybe we can spend a moment on this, just so --

CHRISTINE MAINVILLE: Yes.

MICHAEL BURNS: -- you're clear is that the train testing has a -- has a very specific number of tests. The quantity I can't remember, but it's not -- it's testing that can be done -- if we're not obstructed, could be done in a week or a week and a half, and then we validate the results with our safety committee and then the train itself is -- we certify not the train but that our VOBC system controls the train as it's supposed to. We don't certify the train. That -- that's a small set, and it's done incrementally as trains become available. The -- the broader or more complex and time-consuming is testing on the -- on the track or testing in the control centres.

CHRISTINE MAINVILLE: And on the track, that's the dynamic PICO testing; correct?

MICHAEL BURNS: Well, there's -- I'm -- my concern is you've -- you're saying "dynamic PICO testing." We refer to that for the train, but there are tests where we -- we have to see how

our -- we -- and we use trains, so they're moving in some -- on some tests, so that is dynamic, but it's testing to see how the train performs on a section of track and it performs as we expect.

We also do -- before we get into tests with train movements, there's other tests that are performed to make sure that communication between the zone controller and the control room is -- is -- is operating as -- as expected. Because what we're providing is a communication system, in -- in simple terms. So we need to make sure that all the communications that are expected are being sent and received by the -- the right parties.

CHRISTINE MAINVILLE: And so would Thales also have conducted testing on the -- the full track - not just a test track but on the entire --

MICHAEL BURNS: Oh, yes.

CHRISTINE MAINVILLE: Yes.

MICHAEL BURNS: Oh, yes. The main line, from a Thales perspective, is broken into four zones, and testings are done zone by zone. And there's communications across zones to each other, and that is tested as well. So we completed all of that testing before the decision was taken

to go into revenue on the main line, and main line only. So yes.

CHRISTINE MAINVILLE: And so were -- in terms of delays, you spoke about the yard, but is it fair to say that the delay to the completion of the stations impacted scheduling for Thales?

MICHAEL BURNS: Insofar as -- and I'm not familiar with the station delays you're referring to, but we have to be able -- whether there's an elevator operating at Rideau is of no consequence to Thales, so as long as the track is clear and as long as there isn't other construction, you know, going on that has the potential to interfere with a train movement, it would not necessarily delay Thales testing. But clearly the -- the -- that -- those were the -- probably the final steps, I know, in -- in finishing the civil construction, but the delays predated all of that station completion.

CHRISTINE MAINVILLE: And so what were the main sources of delay outside of the Alstom/Thales interface and the vehicles but as it relates to infrastructure? Was there -- in terms of the tracks, was there -- did that -- was there any delay there that impacted Thales?

MICHAEL BURNS: The -- the -- the entire civil construction schedule was later than originally planned, so the answer to that is yes. And, you know, they also experienced a sinkhole, right, and -- downtown, so that would have caused a problem for testing, obviously, and what we were forced to do is do some testing on the extremes of the -- the guideway but not in the core, the downtown core. So Thales tried to find a way to work around any of those I'll call them obstructions or -- or inefficiencies to get some testing completed, but it wasn't done -- in an ideal world, it would have been a much more -- not fragmented into pieces.

CHRISTINE MAINVILLE: M-hm. And I just want to be clear on the delays to the yard and how that impacted Thales. Was that -- you spoke about the installation of Thales's equipment not going -- the equipment that was not going on a train. Can you just be clear on what you mean by that?

MICHAEL BURNS: Well, in the -- both -- there's no difference between the yard and the main line in term -- terms of the type of equipment that Thales provides that OLRTC had installed. So there's radios -- I call them wayside radios;

there's switch machines. Part of the detection of the train is dependent on a transponder tag that is on the -- between the tracks - and there's hundreds of them that the onboard system reads as the train goes over the tag - and the -- the control centre, with all the computer systems and the -- the mimic wall display of the guideway where you can see the train movements. Those were all equipment and computers that we provide and OLRTC was responsible to install.

CHRISTINE MAINVILLE: And so what was the issue there? How was that impacted by the delay to the yard?

MICHAEL BURNS: Well, they couldn't install until they finished the construction piece, and so it's -- you can't pick a particular source as the cause. It's all the pieces leading up behind it, so -- but there were delays in that, and we were notified, surprisingly, that they were going to -- we were told to not continue testing in the yard, that they had taken a decision to not commission the yard and to do it -- to separate the two events. Well, by contract, they're supposed to be commissioned at the same time, or before revenue service, the yard was supposed to be commissioned.

CHRISTINE MAINVILLE: Right. And is the implication of that that the yard is not automated?

MICHAEL BURNS: The yard is not automated.

CHRISTINE MAINVILLE: And is that the -- that's the implication of not having commissioned it?

MICHAEL BURNS: Right. There's -- there's restrictions that we impose on any of the operators, like RTM or OC Transpo that they have to operate train movements manually or with some restrictions. So there's -- it's a complication for probably RTM's operations, and certainly compounding that is the number of trains that -- like, they have Stage 2 trains that are in some level of assembly or completion but not tested that are occupying the yard as well.

CHRISTINE MAINVILLE: And is the yard still not automated?

MICHAEL BURNS: The yard still is not automated.

CHRISTINE MAINVILLE: And do you know why that wasn't done?

MICHAEL BURNS: It's getting -- well,

you have to go back to the -- the origin of the decision to proceed with the Stage 2 trains. The construction that was almost done in the yard, a lot of it had to be torn up to extend the tracks to accommodate more trains and add -- add lanes to the storage area. So that -- that was a profound impact on our ability to test.

Now, in the -- we are getting very limited access to perform tests. The priority of OC Transpo and RTM, as they have explained to me, is that the priority is testing of the Stage 2 trains over the commissioning of the yard, and that, I assume, is to be able to maintain the -- the fleet for the main line revenue operations. So they're building in float to their fleet of trains.

CHRISTINE MAINVILLE: Okay. Can you talk a bit more about how the schedule impact for Thales was mitigated? So you've given at least one example of the amount of prolongated testing and how that schedule managed to get compressed, but were there other impacts to that, and how were they addressed?

MICHAEL BURNS: Well, the -- if I can speak first to the acceleration, prolongation, the -- we were funded to accelerate by deploying a

team, an additional team, which we did, but the access and the other conditions -- or assumptions and conditions that OLRTC had to fulfill weren't largely completed.

So one of the conditions was that we would deploy another team, and those teams would each get so many hours in a week for testing, but we didn't get those hours, and our -- our testing is a function of hours approved and -- on the track. So we know how long it will take to do a test, but it's a function of access hours, and OLRTC struggled to grant us those access hours, and that was because there was still -- well, during the same approach of acceleration, OLRTC was trying to also accelerate and complete a number of other major systems, such as the overhead catenary system. So you can't have trains running underneath workers that are trying to complete overhead catenary power.

So there was -- there -- Eugene's approach was throw everyone onto the -- into the guideway and get everyone to do everything all at the same time, but from a safety standpoint, you -- we couldn't, and nor did they authorize unsafe activities.

So the OLRTC failed to recognize all the other suppliers or users that needed to do either installation and testing - or even maintenance at that stage. So there was a number of stakeholders all needing the same access, so not everyone could get there. So it meant -- even though we doubled up our resources, the test hours that we were able to be granted was severely restricted.

CHRISTINE MAINVILLE: Okay. And are there any repercussions of that ultimately on the reliability of the system?

MICHAEL BURNS: No.

CHRISTINE MAINVILLE: Okay.

MICHAEL BURNS: No. The -- well, let me -- let me take that back. I can speak for the Thales system. I cannot speak for the other systems that were operating under that hurry-up approach.

CHRISTINE MAINVILLE: M-hm.

MICHAEL BURNS: Right?

CHRISTINE MAINVILLE: And did Thales participate in trial running?

MICHAEL BURNS: No. We had resources in Ottawa. I specifically asked -- the director at

that time was Matthew Slade, what support he needed from Thales or our participation in the trial running, and I was advised we were not to participate in trial running, but he would appreciate us having techs in Ottawa as a backup for -- if an issue came up that they could immediately check and investigate.

CHRISTINE MAINVILLE: And those were not resorted to, those --

MICHAEL BURNS: No. They -- the people that we had there were not called upon to respond to anything.

CHRISTINE MAINVILLE: And did Thales have any concerns about not participating in trial running? Would it have preferred to be there?

MICHAEL BURNS: We didn't have an opinion. It -- it -- we had -- we had provided the certification that our software was fit for revenue, but we couldn't -- we couldn't offer an opinion of whether the system was ready to go into revenue, just that our software was safe and -- and had been tested and certified for a revenue operation.

CHRISTINE MAINVILLE: Was there, as a result, though, an ability to run the trains and

troubleshoot for unexpected issues that Thales might have benefitted from?

MICHAEL BURNS: Could you restate that again?

CHRISTINE MAINVILLE: Yes, sorry. I don't think it was clear. Was there -- would there have been value - let me put it that way - to Thales in a period of running the trains beyond the testing to troubleshoot for potentially unexpected issues arising?

MICHAEL BURNS: I would -- I would say my -- my view is that the -- our testing has already washed out those bugs that may -- may have occurred, so my -- I would say no. I think if anything that would have some benefit would be the trains -- because the trains had experienced some issues, so if -- but we've been operating with a mix of trains as they were offered to us, but those trains should all perform in the -- identically, right?

So I'm not an engineer, but I would say no, there's no value, I think, in extend -- well, there's always value in more and more testing. You may find something. But the level of testing that was performed by Thales is enough to satisfy us

that it's -- we've -- we've found any -- any problems that could arise.

CHRISTINE MAINVILLE: Do you have a view as to whether there's a need for a burn-in period for the -- and maybe it's not specific to Thales's systems, but the trains generally?

MICHAEL BURNS: Well, I think the burn-in, as you characterize it, there's -- I think there's always value in a burn-in of any -- any electromechanical system, but I believe as they go through the testing that Thales does with those trains, and I believe even after we perform our D-PICO and certify, I believe Alstom does -- or -- I believe it's either Alstom or OLRTC does a burn-in of the train. They -- they run it for some period of time.

CHRISTINE MAINVILLE: So you think there may have been one in this case.

MICHAEL BURNS: I think -- as we speak today, each of the trains, after they are certified by Thales, go through a burn-in period.

CHRISTINE MAINVILLE: Okay. Do you know or have a view as to whether there is value to a soft start after trains go into service, sort of to allow for troubleshooting of issues after

revenue service availability?

MICHAEL BURNS: I -- I'd like to decline to comment.

CHRISTINE MAINVILLE: Okay. Because Thales is not well placed or you personally are not well placed to speak to that?

MICHAEL BURNS: Well, it's -- I can speak in general terms, and, you know -- okay. I'm going to answer this. In a -- in a generic deployment of a complicated system, there's an inherent risk if you go 100 percent on Day 1. And so there -- there is some hypothetical benefit of starting slower, and that may shake out operational bugs, not necessarily a problem with the system, but how it -- how the supporting operations are able to support.

CHRISTINE MAINVILLE: And in terms of the winter testing, I understand there was winter simulation testing done? Would you be aware?

MICHAEL BURNS: Well, because the testing was protracted over a long period of time, there was some winter testing, and I know it was a requirement for winter validation, but are you specifically asking about what validation was done on the trains or as the system?

CHRISTINE MAINVILLE: Well, on the trains. So in terms of being tested in real conditions, you believe there was some of that done?

MICHAEL BURNS: Not -- not as a planned specific test to see how the trains could move snow or ice, but by extension, as the testing happened over a number of seasons, it did get some of that. I thought you may be asking about the qualification testing that was done on the train that -- by Alstom. There was an environmental simulation. I think it was done at the NRC labs.

CHRISTINE MAINVILLE: Right.

MICHAEL BURNS: Okay.

CHRISTINE MAINVILLE: Well, would you have -- in terms of from Thales's perspective, would you have a view as to whether that type of simulation is sufficient, or you would have wanted an actual winter testing done in winter conditions?

MICHAEL BURNS: I'm not in a position to comment.

CHRISTINE MAINVILLE: And can you just speak to or confirm how this system worked in terms of the different grades of braking, which I think were dependent on weather conditions? And there --

as I understand it, there was an issue with the speed profiles not being suited for Alstom's braking mechanisms. Is that something that --

MICHAEL BURNS: No, that's -- that's news to me.

CHRISTINE MAINVILLE: Okay.

MICHAEL BURNS: I'm not -- I'm not aware. I know there was a lot of -- a lot of discussion, all part of the ICD, where we needed to get, you know, particularly the guaranteed emergency brake rate, which is referred to as GEBR - it's an acronym - and then that data, all of the braking performance curves, we load that into a safe braking model, and that -- that is submitted to OLRTC and I assume shared with Alstom. But that -- that modelling is done largely with inputs of the behaviour that Alstom has told us the train will perform. And yes, there's different braking commands and such, but... I'm not aware of a specific issue that Alstom had raised.

I had raised a concern with OLRTC - and at that time it was Matt Slade - because they were replacing the brake calipers, and they were coming up with a -- from a different supplier, and I raised the -- the concern that because those brake

calipers materially affect the propulsion and braking performance of the train, and you were -- they were replacing all of them on all the trains that had been D-PICOed by us and certified, would they have to be recertified. And I was advised by -- there was a letter from OLRTC on this that they had determined that the replacement brake calipers behaved identically to the originals, and therefore they were taking the position that the trains did not need to be recertified.

CHRISTINE MAINVILLE: And that's something that Thales could not verify itself, I take it.

MICHAEL BURNS: No. There's -- we have no way of -- of validating.

CHRISTINE MAINVILLE: And so did Thales ever need to recertify -- following its safety certification, did it ever need to recertify following -- the system following retrofits or repairs or other work done?

MICHAEL BURNS: No. We -- we've been never -- we've been never called in to recertify a train that has been previously certified. So we're -- and nor are we aware of if there's changes to the train in some way that might cause a demand

for recertification.

CHRISTINE MAINVILLE: Are you aware of the retrofits that were deferred until after testing or after revenue service availability?

MICHAEL BURNS: No.

CHRISTINE MAINVILLE: Retrofits to the trains?

MICHAEL BURNS: I'm aware that there were some retrofits being planned, the details of which, no, I'm not familiar with.

CHRISTINE MAINVILLE: So Thales was not asked to give a view as to whether it may need to perform additional testing pursuant to those --

MICHAEL BURNS: No.

CHRISTINE MAINVILLE: -- deferred retrofits.

MICHAEL BURNS: We were definitely not asked to offer an engineering assessment of the validity of the current certification.

CHRISTINE MAINVILLE: You've said before that you wouldn't -- didn't have a view or are able -- or not able to express an opinion as to the readiness of the overall system. Is that fair?

MICHAEL BURNS: Correct, yes.

CHRISTINE MAINVILLE: So do you --

could I ask it this way: Did Thales have any concerns relating to Alstom's readiness or the readiness of the rolling stock at the time of opening?

MICHAEL BURNS: There's always a danger of -- of being perceived as throwing rocks at your competitor, and I'm not, but -- I -- I have nothing that I'd be prepared to go on record of having a concern for that. I -- I really have no way of -- of knowing whether there's -- there's a legitimate concern.

I do -- I can look at what had happened over the preceding years, and there was a lack of transparency that would cause a critical mind to maybe question whether there was a concern or should there be a concern, but officially, I -- I am not in a position -- I have no -- I have no visibility to make that assessment.

CHRISTINE MAINVILLE: What about OLRTC's readiness? Would you be able to speak to that?

MICHAEL BURNS: Well, whether the -- they're -- that they were ready for revenue service?

CHRISTINE MAINVILLE: Yes.

MICHAEL BURNS: Well, I would say almost before revenue service was achieved, they had kind of started to demobilize their project team. I think the question ought to be, you know, were they ready to trans -- transfer responsibility to, like, Rideau Transit Maintenance to maintain the system.

CHRISTINE MAINVILLE: Yes.

MICHAEL BURNS: Yeah. My -- my concern about the maintenance aspect is -- and I'm uncertain how robust the -- an ongoing training program is in place because under the -- the agreement with OLRTC, we provided training to their -- OLRTC's trainers, and so they were going to have a -- you know, an embedded training organization that would train operators, train drivers, RTM, also maintenance, and we executed that training, and in some cases with Alstom maintenance, actual maintainers.

But I -- I believe that training infrastructure at the very least became invisible to us. I know that the individuals that were deemed the trainers, that trained the trainers, they have left the organization, but I don't know if anything has replaced them. And there's

certainly a lot of turnover in Alstom maintenance, so I have a concern that they're able to effectively maintain the systems.

CHRISTINE MAINVILLE: Because Thales has not been brought in to retrain any new trainers.

MICHAEL BURNS: Correct. I have -- I have proposed on a number of occasions that we would come and perform training as they deem fit, but that has not been -- that offer has not been taken up.

CHRISTINE MAINVILLE: And so Thales trained OLRTC trainers on both operations and maintenance; correct?

MICHAEL BURNS: Yes, correct.

CHRISTINE MAINVILLE: And was there training on -- did it cover system operations, standard operating procedures, incident response, and safety?

MICHAEL BURNS: Definitely not incident response. What were your other topics?

CHRISTINE MAINVILLE: The system operations?

MICHAEL BURNS: Yes, system operations.

CHRISTINE MAINVILLE: Standard

operating procedures?

MICHAEL BURNS: Well, OC Transpo would probably have their own -- they would take our procedures, and they would develop their own operating procedures with the guidance of what we have provided. So I want to -- I want to be careful that you're not thinking that we -- we are developing OC Transpo's CONOPS.

CHRISTINE MAINVILLE: Would you have had a view into OC Transpo's operating procedures?

MICHAEL BURNS: A view into -- no, we wouldn't have had a view into, no.

CHRISTINE MAINVILLE: Okay. And that's not a concern for Thales, that it wouldn't be able to review that?

MICHAEL BURNS: We wouldn't have a -- it's -- it was -- it would be beyond the reach of Thales's scope, so I'm not sure how those procedures necessarily were -- they would have been developed with OC Transpo's view of how -- how they -- they choose to operate the system, and I don't mean ignoring what -- what we're providing, but there's definitely -- they would have a certain style -- or it's not a style. Process that reflected even their -- their union agreement of --

of turnover of -- or people -- number of people in the operations centre, for example.

CHRISTINE MAINVILLE: So Thales delivered, I take it, some manuals or handbooks to OLRTC?

MICHAEL BURNS: As part -- as part of the training program, yes. And -- and as those -- if those manuals required any update, then we would update to a higher revision level and issue them to OLRTC, and then they would pass those along to the user, which would be RTM or OC Transpo or both.

CHRISTINE MAINVILLE: Did Thales not also provide them directly to RTM, given their direct line of -- direct contractual line with RTM?

MICHAEL BURNS: Contractually, the manuals are -- are from the OLRTC agreement, and it was -- it's for OLRTC to convey those updated manuals to RTM. Now, having said that, there's been a number of incidents where we found that they didn't have the most current manual, and I provided it directly to RTM.

CHRISTINE MAINVILLE: Do you have a view as to the sufficiency of the training for the operators, where -- whether the training that would have been provided was sufficient?

MICHAEL BURNS: No. I -- I don't have a view in this specific instance, but our training is well established, and it's not been developed uniquely for Ottawa. It's -- it's adapted for -- just as our software is adapted for the Ottawa environment, our training manuals and the training material would have been adapted to reflect those adaptations, but it's a well-established training program that's used in other countries around the world.

So if you're asking me the absorption level of the students, that I can't speak to, but the students are -- are tested at the conclusion of the -- each training module, and the results are -- are provided to OLRTC that they've passed.

CHRISTINE MAINVILLE: M-hm.

MICHAEL BURNS: So you give them that feedback.

CHRISTINE MAINVILLE: And do you have any knowledge of whether their training was rushed or anything like that?

MICHAEL BURNS: I'm not aware that there was any rush. At the time, OLRTC had, as I say, a training group. There was a manager of that group, Randy Fonger, and we would say we need X

weeks of training, and he would schedule the time. We'd provide the materials in advance, and then we would send the trainer or multiple trainers down, and the training was conducted and tested.

So I have to assume that the -- the students that were assigned were competent, that -- that came into the training with the -- the specified prerequisites for the training, and I don't -- I -- I don't imagine that there was a -- an issue. The only issue that may be in play today is are those students still there, and if they're not there, how were -- how was that training or retraining or the replacements trained to cover that. That would be my only reservation.

CHRISTINE MAINVILLE: Okay. And am I right that there was no interaction, then, between Thales and the operators? Like, are you able to speak to the level of interaction, if any, between Thales and the OC Transpo operators directly?

MICHAEL BURNS: No. During testing, quite often the Thales techs will be in the OCC because they have to coordinate with the operators to get access to trains, they have to launch the trains, so there is ongoing interaction with the control centre for -- as a minimum of just in

support of conducting our -- our tests.

CHRISTINE MAINVILLE: And subsequent to testing, though, there's not a direct relationship.

MICHAEL BURNS: No. The doors are locked.

CHRISTINE MAINVILLE: To the control room.

MICHAEL BURNS: Yeah, from a -- secure access.

CHRISTINE MAINVILLE: M-hm.

MICHAEL BURNS: So we just -- we can't just walk in.

CHRISTINE MAINVILLE: So in your experience, is the level of operator interaction that Thales had before going live, before revenue service, was that normal, in your experience?

MICHAEL BURNS: Well, my experiencing -- my experience being limited to this project, I -- I have heard that there -- of no issue with the interaction with the operators.

CHRISTINE MAINVILLE: Okay. And what exactly has been Thales's role post-opening? Has it been involved in resolving deficiencies or performance improvements?

MICHAEL BURNS: Part of the -- part of

our -- my challenge is that we have -- we have a team -- two teams in Ottawa right now trying to commission the yard and trying to test trains, the Stage 2 trains. So they will routinely be tasked to investigate things that maybe a more competent maintainer might be able to do themselves, but in any case, we're not being tasked to do improvements of our system that I can recall. I know the -- the City had a number of things they wanted differently but were not provided, but we've been -- to the extent that we can, been supportive.

One example I can think of is that the City I think it was last year hired a cyber security consultant, and they wanted to do penetration tests on the system to see how the CBTC system would withstand a cyber attack. So if that's the -- an example of a -- an improvement, it's not that we're changing anything, but it was more, I think, out of an emerging cyber threat that the City's asked for RTM to fund us to participate in -- in a -- an investigation. So we've done that.

CHRISTINE MAINVILLE: What about some of the issues that the LRVs have experienced since revenue service - some of the breakdowns,

operational problems? First of all, do you have any view as to whether the Thales/Alstom interface played a role in any of these incidents?

MICHAEL BURNS: From what I have read, a lot of it in the press or from analysis of the system logs that we have, no, the Thales system did not have an -- have an impact on -- on the train issues.

CHRISTINE MAINVILLE: Do you know -- there were door issues, for instance. Would there be any connection to Thales's systems?

MICHAEL BURNS: I touched on that earlier --

CHRISTINE MAINVILLE: Right. Right.

MICHAEL BURNS: -- right? So that's the only one where I think there was a connection. In our assessment -- and there's letters that we've sent back explaining our findings and how we have made modifications to the unexpected behaviour -- or unexpected reaction from -- initiated by the train to the door closing. So we went and modified -- like, you can -- you can lay it all out in the ICD, and everyone can design it, but then if -- if something isn't in the ICD and a behaviour surfaces, then the only recourse is you have to

react to it, and that's what we've done is react to what wasn't disclosed to us to avoid that circum -- the series of events that -- circumstances that led to that door close incident, then we've -- we've taken steps that it would not close.

CHRISTINE MAINVILLE: Do you have any awareness of the following issue, where periodically there may have been improper platform or no platform information being displayed on the driver's display, which would have been reported on the minor deficiency list that would have been devised by -- I believe that's between OLRTC and Alstom?

MICHAEL BURNS: Sorry. I'm -- whose deficiency list?

CHRISTINE MAINVILLE: Well, a minor deficiency list -- well, let me ask you first: Do you have any awareness of these deficiencies lists?

MICHAEL BURNS: I'm aware there was some issue with the reporting that -- the passenger information, there's a lag, but you -- you described it a little differently, so... And minor deficiencies in whose list? And therein is a problem that I won't -- but there's a lot of people keeping lists, and there's not a central repository

of -- of issues that get -- need to be triaged, validated, or rejected.

CHRISTINE MAINVILLE: Okay.

MICHAEL BURNS: So --

CHRISTINE MAINVILLE: Well, let me just ask you the question: Are you aware of this issue that I describe around a lack of platform information or incorrect platform information being displayed on the driver's display?

MICHAEL BURNS: Not on the driver's displays. I'm aware of an issue with the passenger information, so the information on the platform that the public will see, where it's incorrect --

CHRISTINE MAINVILLE: Okay.

MICHAEL BURNS: -- or it -- there's a lag where there's either no information or it's the wrong time shown.

CHRISTINE MAINVILLE: So if something like that happens, is Thales brought in to help with addressing that?

MICHAEL BURNS: In this case, we've been brought in by RTM, and we've been trying to determine the source of the problem. My understanding from the engineering group is that there's a delay in the update rate, and it becomes

a cumulative one, so at some point you will get this faults or inaccurate report. We've been struggling with working with the SCADA subcontractor, Willowglen. They don't appear to have a very good details to share with us about how their messages are generated and shared. So it's going to come down to one of the two parties may need to make some change to avoid this going forward, but Thales is involved, and Thales is participating and supporting RTM.

CHRISTINE MAINVILLE: About the second derailment, I think, in particular --

MICHAEL BURNS: This is the September?

CHRISTINE MAINVILLE: Yes.

MICHAEL BURNS: Okay.

CHRISTINE MAINVILLE: 20 --

MICHAEL BURNS: '19.

CHRISTINE MAINVILLE: -- 19.

MICHAEL BURNS: '19? Yes.

CHRISTINE MAINVILLE: 2020.

MICHAEL BURNS: No, September 2019 was right after the start of revenue.

CHRISTINE MAINVILLE: Yes. No, it --

MICHAEL BURNS: And then the next one was what, November? No, that's when -- that's when

the system came back on. That's not fair. You've got notes. I was told I couldn't have them.

CHRISTINE MAINVILLE: That was accurate information. Yes, 2021. September 2021.

MICHAEL BURNS: September 2021.

CHRISTINE MAINVILLE: So the Tremblay Station derailment that led to a longer shutdown.

MICHAEL BURNS: Okay. Right. Because it was after that second derailment that the system was shut down until November for investigation.

CHRISTINE MAINVILLE: And if I'm not mistaken, I believe that's the one where there was significant damage done to the track.

MICHAEL BURNS: This is where the gear box under -- the train's gear box dropped down and damaged hardware -- systems along the hardware, like our wayside radio unit and antenna were knocked off.

CHRISTINE MAINVILLE: I just don't want to confuse between the two, but... This is one related to, I think, improperly torqued bolts.

MICHAEL BURNS: Right. And the result of the improperly torqued bolts is the gear box fell off.

CHRISTINE MAINVILLE: Right. Right.

MICHAEL BURNS: Right. Okay.

CHRISTINE MAINVILLE: So was there not a potential issue there that you may -- may or may not be aware of about the trains not -- the train's systems not identifying faults, the faults in the train prior to the derailment?

MICHAEL BURNS: I don't -- I can't imagine there would be any system that would be able to detect loose bolts. There's --

CHRISTINE MAINVILLE: Do you --

MICHAEL BURNS: Is that what you're asking?

CHRISTINE MAINVILLE: Well, let me ask you more broadly. Do you have any understanding of whether the -- prior to the full derailment whether it ought to have been noticeable? So whether, for instance, the driver or the operator of the train should have been able to notice from the systems that -- that there was some issue?

MICHAEL BURNS: Oh, I see what you're saying. I think I -- you're -- you're asking whether the CBTC system should have -- have provided some alarm to the train operator or to the OCC that there was a malfunction. And the answer is we did, but it -- it's not until the train

crossed over a switch, and because of the -- you know, the gear box that had fallen down or dragged along, the switch is considered disturbed because it -- it recognizes something's out of alignment, and then our system notifies the control centre that -- and we emergency brake the train, EB the train.

So we wouldn't know initially, but it's only until we cross over a switch that gets disturbed that we report that -- otherwise, we don't have -- we're not sensing everything. We can only sense what's connected to our system, and in that case, when the switch sensed -- or when the switch was determined to be disturbed, the safe reaction is we command the train to emergency brake, and then by reviewing the logs, we know when the emergency brake occurred and what was the cause, so the logic behind that. We know why it EBed - that the switch was disturbed, forcing the train to be emergency braked.

CHRISTINE MAINVILLE: Okay. Because I only have a couple minutes left, I'll just ask you a couple focussed questions. Do you -- in terms of the MSF, the maintenance facility, did you observe any issues with the suitability of that facility in

terms of impacting Thales's delivery?

MICHAEL BURNS: The suitability? I'm not sure how to answer that.

CHRISTINE MAINVILLE: Was it an adequate facility for Thales's work?

MICHAEL BURNS: Well, Thales has -- the facility is the facility, and the terms -- the guideway's the guideway. We've provided notification to OLRTC that we thought their track geometry on the expanded yard is too close. There's a potential conflict where the -- where you could have a sideswipe of trains, depending on where the train -- two trains are. So we still haven't completed the testing to be able to quantify whether we're going to be able to get the trains that they expect to be in the shed in far enough that it doesn't obstruct trains coming out by the adjacent lanes. So if that -- if that answers your question. There --

CHRISTINE MAINVILLE: That's capacity. It's a capacity issue.

MICHAEL BURNS: It's capacity to some respects, but that capacity -- they'll either have to accept a diminished capacity or would have to relay track to avoid the -- the -- the proximity

of -- of where two tracks are -- are too close together.

CHRISTINE MAINVILLE: Would Thales have any insight into value engineering decisions that Alstom may have made?

MICHAEL BURNS: No.

-- OFF THE RECORD DISCUSSION --

CHRISTINE MAINVILLE: Did Thales ever produce a mitigation plan, or was it asked to produce a mitigation plan to mitigate the impacts on the schedule?

MICHAEL BURNS: Not that I recall.

CHRISTINE MAINVILLE: At what point in time would -- did it become apparent to Thales that the original RSA deadline, revenue service availability deadline, would not be met?

MICHAEL BURNS: I -- very early I identified it as a high risk - in 2014 is my guess or estimate. Definitely by the spring of 2017, OLRTC appeared to have come to the same conclusion with the -- the change in the project team, where they brought in Eugene and a couple of other people with the -- what appeared to be the objective is to push -- push it through to try and mitigate as much as possible, but they were already recognizing that

May had gone, and they were hoping to get it complete by the end of 2018.

CHRISTINE MAINVILLE: And was that specifically because of the delay in the rolling stock or other aspects of the project?

MICHAEL BURNS: All aspects were, I think, delayed. Rolling stock was one, but they had their challenges with infrastructure development as well.

CHRISTINE MAINVILLE: Do you have any sense of how they compare or whether the rolling stock delay was the most significant delay on the project? Recognizing that there's some interrelation between the various pieces.

MICHAEL BURNS: No, I -- I don't have an opinion. Definitely rolling stock impacted Thales the most -- or was more visible, sorry, not -- is a better description, but there was a -- when we were still operating on the basis that we were going to commission the yard first, I remember having many meetings and -- with OLRTC and having to challenge the view that they were going to make the completion date of May, and I -- I argued that it was impossible, based on the dates that they were relaying to me.

So there was -- I would say there was -- there was a reluctance to acknowledge the risk to May 2018 and incorporate some recovery plan until much later. They definitely -- the recovery plan was to do -- to -- this acceleration program, but at that time they were still looking at accelerating but knowing the May 2018 had -- was gone.

CHRISTINE MAINVILLE: And sorry, you said this is at what point in time did they recognize they were not meeting May 2018?

MICHAEL BURNS: At -- from my review of -- of the correspondence, it was October of 2017.

CHRISTINE MAINVILLE: Okay. And do you know what -- well, first of all, did Thales have transparency into OLRTC's, you know, broader schedule, project schedule?

MICHAEL BURNS: I was -- I was -- participated in several scheduling workshops, some initiated by myself, some by OLRTC, and I would see their civil design construction schedule. They never did produce what I would see as a full integrated schedule. They may have done that, but that was not shared with me.

CHRISTINE MAINVILLE: And the -- what you did see, do you know whether Alstom was made privy to that as well?

THE WITNESS: I -- I would have no idea.

CHRISTINE MAINVILLE: Okay. Am I right that Thales primarily dealt with Francis Fitzgerald at OLRTC with respect to scheduling and seeking extensions?

MICHAEL BURNS: You broke up.

CHRISTINE MAINVILLE: Oh, sorry. Am I right that Thales primarily dealt with Francis Fitzgerald in terms of scheduling and seeking extensions?

MICHAEL BURNS: No. Frank was there not for a long time, but he came in I think -- I think Eugene brought him in along with Tom Burgoyne as the heavy to try to push everyone along and commission. I had some interaction with Frank on extensions but also had more probably with Matt Slade. So it -- we've been in an incremental funding mode for several years.

CHRISTINE MAINVILLE: How would you characterize Matthew Slade's level of -- or his management of -- on the project?

MICHAEL BURNS: I had a very good relationship with Matt Slade. I thought he -- he had a good grasp of the challenges. I think he -- you know, he -- he came in -- I think he was assigned by the executive committee to come in after Eugene was -- after Eugene left, so the -- the executive committee assigned Matt to step down from -- he was -- he was sitting on the executive committee, and he was asked to step down into the project director role, but I thought he -- he was -- he was engaged and familiar with the issues. I had regular meetings with him. I -- I have no issue with him.

CHRISTINE MAINVILLE: And Thales was granted an extension, correct, to its ultimate delivery date?

MICHAEL BURNS: Several extensions.

CHRISTINE MAINVILLE: Several, right. And do you know whether there was some coordination by OLRTC in terms of Thales's schedule and Alstom's schedule?

MICHAEL BURNS: There were -- as part of one of the extensions of time, because the extension of time wasn't just commissioning the yard or the main line, but testing of trains, and

some of the extensions of time are for the Stage 2 activities, where -- so our funding for the Stage 2 onboard systems and -- and testing of the Stage 2 trains, we were given -- or shown an Alstom schedule, like a best-case/worst-case scenario, and that was the basis of our -- our variation order, and -- but since then, Alstom has been -- since then, Alstom has never been able to meet those schedules.

And just to be clear, I'm stepping into the Stage 2 realm, but it answers, I think, the same question. And, like, to this day, we have no commitment that OLRTC's able to share with me about when Alstom will deliver the remaining fleet of -- of trains for us to test.

And as it relates to the Stage 1, no, we -- we never really got credible schedules. We were shown dates, but they routinely were missed. So the way we've approached it commercially was we'll put a test team there exclusively for train testing, but it's -- it's -- you -- you have to get the trains to us, and if you don't have the trains to us, you -- we're -- you're paying for the time and the -- the testers are -- are deployed in Ottawa.

CHRISTINE MAINVILLE: But do you know what, if any, coordination there was at OLRTC's level in respect of those two schedules, Thales's schedule and Alstom's schedule?

MICHAEL BURNS: I'm not aware of what coordination OLRTC had vis-à-vis Alstom.

CHRISTINE MAINVILLE: Okay. Those are my questions, unless, Fraser, you have anything.

FRASER HARLAND: Maybe, actually, just a couple of -- if that's okay with --

MICHAEL BURNS: Yep.

FRASER HARLAND: -- Mr. Burns and his counsel. I just wanted to go back to the ICD issue, just a couple of pretty specific questions. I think you had mentioned that the final version in the original plan schedule was September 2014? You can correct me if I'm wrong, but can you tell me when the -- the ICD was actually -- Thales's ICD was actually finalized?

MICHAEL BURNS: I -- off the top of my head, I don't recall. It would have -- I think it would be sometime in 2015, but I'm -- it's a -- it's an estimate on my part right now.

FRASER HARLAND: And can you just confirm for me when ICDs were going back and forth

between Thales and Alstom, that was via OLRTC; is that right? Or was there a direct --

MICHAEL BURNS: Correct. There was no direct -- I mean, there was informal communication with Alstom, so there would probably be emails between our engineers and Alstom, but the formal transmission of updates to ICDs were funneled through OLRTC.

FRASER HARLAND: And are you aware of any issues in terms of timing as to when Thales would provide its ICD and then when OLRTC would get that to Alstom and vice versa? Are you --

MICHAEL BURNS: I would have no visibility of when they provided the ICD that we provided to them and when they sent that to Alstom. I don't know.

FRASER HARLAND: Okay. And I guess a final question -- and if you're unable to answer it, it's fine -- but the level of change that happened to the ICDs, in your experience, was that sort of the normal iterative process, or was it longer and more difficult than -- than it maybe should have been?

MICHAEL BURNS: My experience -- and it's outside of the signalling business, but

looking at -- and I participated in all these workshops on the ICD development. The parties, if they know what they need, they should be able to convey their requirements to the other party in several meetings, and then the update of the ICD, you may -- you may find that there's a translation disconnect. So there may be minor updates, but in this case it went through, as a newcomer to this business, far too many iterations, which brought me to the suspicion - and this is only suspicion - that there was another motive for delaying or changing unilaterally the content of the ICD.

FRASER HARLAND: And I know I said that was my last question, but do you have a sense of whether the ICD process caused I guess what we could call critical path delay with -- with the production of the trains, ultimately?

MICHAEL BURNS: No, I don't think so, because the -- the production of the train is independent of what we're going to put on that train. The only thing that would inhibit production of the train is if Alstom hadn't really finalized their interfaces that they needed, like did they -- they had to figure out what signals had to be on dedicated lines and which could be

transmitted over ethernet connection.

So if they were still developing that requirement, then it could have had an impact on -- on the production, but they never shared with us that they were still in an early design phase of -- of the train.

FRASER HARLAND: I don't think I have any other questions, unless, Christine, you have anything arising out of that.

CHRISTINE MAINVILLE: No. Thank you very much for giving us that additional time. I think we can go off record.

-- Concluded at 2:18 p.m.

REPORTER'S CERTIFICATE

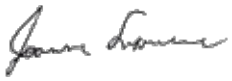
I, JOANNE A. LAWRENCE, RPR, CSR, Certified Shorthand Reporter, certify;

That the foregoing proceedings were taken before me at the time and place therein set forth;

That the statements of the presenters and all comments made at the time of the meeting were recorded stenographically by me;

That the foregoing is a certified transcript of my shorthand notes so taken.

Dated this 31st day of March, 2022.



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