



City of New York

OFFICE OF THE COMPTROLLER

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COMPTROLLER



FINANCIAL AUDIT

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Audit Report on the New York City
Transit Authority's Oversight of Its
Agreement with Bombardier Transit
Corporation for the Design, Production,
and Delivery of the R179 Subway Cars

FP18-091A

December 9, 2019

<http://comptroller.nyc.gov>



THE CITY OF NEW YORK
OFFICE OF THE COMPTROLLER
SCOTT M. STRINGER

December 9, 2019

To the Residents of the City of New York:

My office has audited the New York City Transit Authority (NYCT) to determine whether it adequately managed its \$599 million contract (Contract) with Bombardier Transit Corporation (Bombardier) for the design, production, and delivery of 300 R179 subway cars. We perform audits such as this to increase accountability and ensure that contract provisions are followed.

The audit found that Bombardier failed to provide deliverables that met Contract specifications within scheduled milestone dates. Bombardier's failure to perform under the Contract resulted from its poor project management, which led to performance issues and cascading Contract delays. Specifically, Bombardier did not consistently produce acceptable work during the design stage which led to delays. The delayed designs were followed by the appearance of welding defects in critical structural components. These were not fully resolved until July 2015 and caused substantial production delays. In addition, Bombardier failed to adequately oversee one subcontractor's operations, which resulted in shipments of defective truck frame castings that further delayed production. Further, Bombardier failed numerous mandated systems qualification tests, which led to additional delays. As a result, completion of the Contract has been substantially delayed from the outset and is currently more than 35 months behind schedule.

The audit found that, although NYCT conducted thorough inspections and tests of the finished products, and that it held monthly meetings with Bombardier, those efforts did not ensure the timely production of acceptable deliverables in accordance with Contract specifications. Notwithstanding Bombardier's early and repeated failures, NYCT's senior management did not take actions that effectively enforced the Contract schedule. Among other possible actions, NYCT did not request adequate assurance pursuant to Article 701(B) of the Contract until July 2016.

To address these issues the audit made 20 recommendations, 15 to NYCT and 5 to Bombardier. The audit recommended that NYCT should: enforce its contractual authority by effectively utilizing all of the mechanisms afforded under its contracts; institute written guidance and procedures for NYCT management to follow on the timing and the steps to be taken when requesting adequate assurance and/or declaring default; and conduct annual vendor evaluations in accordance with internal guidelines. The audit also recommended that Bombardier should: strictly adhere to the requirement of the Contract and all subsequent settlement and other agreements with NYCT for the production of the R179 subway cars; promptly and completely provide all information required under the Contract to NYCT; and institute an effective inspection and oversight program.

The results of the audit have been discussed with NYCT and Bombardier officials, and their comments have been considered in preparing this report. Their complete written responses are attached to this report. If you have any questions concerning this report, please e-mail my Audit Bureau at audit@comptroller.nyc.gov.

Sincerely,



Scott M. Stringer

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THE CITY OF NEW YORK OFFICE OF THE COMPTROLLER FINANCIAL AUDIT

Audit Report on the New York City Transit Authority's Oversight of Its Agreement with Bombardier Transit Corporation for the Design, Production, and Delivery of the R179 Subway Cars

FP18-091A

EXECUTIVE SUMMARY

In 2012, the New York City Transit Authority (NYCT) entered into a \$599 million contract (the Contract) with Bombardier Transit Corporation (Bombardier) for the design, production, and delivery of 300 R179 subway cars as part of the effort to modernize New York City's aging subway system.

The scope of work and the technical requirements for the supply of subway cars and associated equipment are set forth in the Technical Specifications section of the Contract. The Contract imposed a milestone payment structure, which dictated that Bombardier received payments after it substantially completed each milestone. The milestones each represent a major advancement in the project, such as submission and approval of design documents; approval of test plans; submission of schedules and prototype components; completion of all inspections and tests; and delivery and acceptance of prototype cars. Under the Contract, Bombardier was required to substantially complete certain milestones before it could begin the actual delivery of the subway cars.

Pursuant to the Contract, delivery of prototype subway cars was set to begin January 12, 2015, and the delivery of all 300 cars to NYCT property was to be completed by January 30, 2017. However, due to multiple issues, including manufacturing defects related to the welding and casting of train components, and delays in passing qualification tests, Bombardier failed to meet its delivery deadlines. The project is currently 35 months behind schedule.

As a result of these delays, as of September 2019 NYCT had assessed approximately \$36 million in liquidated damages. Pursuant to a settlement agreement and mutual release entered into between NYCT and Bombardier dated December 23, 2017 (the Settlement Agreement), a total of \$1.27 million in liquidated damages were withheld; a new delivery schedule was established for the 300 cars required by the Contract; and Bombardier was required to provide 16 additional cars in lieu of the \$28.7 million in assessed liquidated damages that had previously been assessed as of the date of the Settlement Agreement. The Settlement Agreement also provided that additional

liquidated damages could be assessed against Bombardier in the event that it failed to meet a new February 2019 delivery schedule and that NYCT could request additional subway cars in lieu of liquidated damages.

As of the end of January 2019, Bombardier had again failed to meet the new delivery deadline having delivered only 162 of 316 cars pursuant to the Settlement Agreement. Based on NYCT's current forecast, completion of delivery is now expected by December 2019. As a result of this additional delay, NYCT exercised its right in accordance with the Settlement Agreement to request two additional cars at no cost. Thus, NYCT is presently entitled to receive a total of 318 subway cars from Bombardier. As of December 2019, NYCT reported that 298 subway cars had been delivered and of these, 278 were in service, and 20 were still going through acceptance testing.

In this audit, we examined whether NYCT adequately managed the Contract with Bombardier to ensure that it provided the deliverables within prescribed milestones and the approved schedule. The audit also examined whether Bombardier complied with the provisions of the R179 Contract.

Audit Findings and Conclusion

The audit found that from the commencement of work under the Contract in 2012, Bombardier failed to provide required deliverables that met Contract specifications within scheduled milestone dates. As a result, completion of the Contract has been substantially delayed from the outset and is currently more than 35 months behind schedule.

Overall, the audit found that Bombardier's failure to perform under the Contract was the result of its poor project management, which led to performance issues and the significant Contract delays that have occurred to date. In 2012, Bombardier did not comply with the contract requirements by failing to submit the welding procedures, a prioritization plan, and other required documents. Beginning in 2013, Bombardier failed to consistently produce acceptable work during the design stage which caused project delays. Subsequently, welding defects were found in critical structural components, which were not fully resolved until July 2015, approximately 18 months after their discovery in December 2013. These welding defects further led to substantial production delays. In addition, Bombardier failed to adequately oversee one subcontractor's operations, which led to shipments of defective truck frame castings, which in turn further slowed production. Finally, Bombardier did not conduct independent tests of the subway car components prior to the official tests witnessed by NYCT. As a result, Bombardier failed numerous mandated systems qualification tests, which led to further delays.

In addition, the audit found that notwithstanding Bombardier's early and repeated failures, NYCT did not take actions that effectively enforced the Contract schedule. We found that NYCT did not enforce its contractual authority clearly and promptly. Among other things, it failed to enforce contractually mandated schedule requirements when Bombardier did not meet milestones and fell behind the subway car delivery schedule. Further, notwithstanding persistent schedule delays beginning as early as 2013, NYCT senior management did not request adequate assurance pursuant to Article 701(B) of the Contract until July 2016.¹ Due to the delayed and inconsistent production by Bombardier from the outset of the Contract, NYCT's failure to exercise this Contract enforcement tool earlier compounded the schedule delays.

¹ The request for adequate assurance that was eventually sent by NYCT on July 20, 2016, required that Bombardier provide a detailed plan and schedule of its ability to perform the work of the Contract within a proposed delivery schedule to the satisfaction of the Project Manager.

The audit found that NYCT's Project Manager and Louis T. Klauder and Associates (LTK), NYCT's engineering consultants, rigorously enforced the contract's Technical Specifications to ensure that only train cars that meet NYCT's standards are put in service. Although we found that NYCT conducted thorough inspections and tests of the finished products, and that it held monthly meetings with Bombardier, those efforts did not ensure the timely production of acceptable deliverables in accordance with Contract specifications.

The audit also found that NYCT did not follow LTK's specific recommendation that it participate in future First Article Inspections² for the casting supplier, for which a significant percentage of castings were found to have been improperly made. Additionally, NYCT failed to formally evaluate Bombardier in 2013, 2014, 2015, and 2017, as required by internal NYCT vendor guidelines. Finally, in connection with the 2016 evaluation in which NYCT gave Bombardier a marginal rating, NYCT failed to notify Bombardier in a timely manner of its marginal rating. NYCT informed Bombardier in 2018, almost two years later and only after our audit inquired about the notification. The NYCT evaluation guidelines require that NYCT notify vendors of marginal or unsatisfactory ratings.

Audit Recommendations

This report makes a total of 20 recommendations, 15 to NYCT and 5 to Bombardier, including the following:

NYCT should:

- Enforce its contractual authority by effectively utilizing all of the mechanisms afforded under its contract, including requests for adequate assurance and declarations of default when the contractor fails to abide by contractual requirements, such as adhering to Technical Specifications and missing early design milestones.
- Institute written guidance and procedures for NYCT management to follow on the timing and the steps to be taken when requesting adequate assurance and/or declaring default.
- Modify the condition for default in future contracts to include that repeated failure to comply with the requirement to submit all technical procedures prior to start of work, will result in default.
- Conduct annual vendor evaluations in accordance with internal guidelines.
- Document high-level communications such as executive level meetings with the vendor through minutes.

Bombardier should:

- Strictly adhere to the requirements of the Contract and all subsequent settlement and other agreements with NYCT for the production of the R179 subway cars.
- Promptly and completely provide all information required under the Contract to NYCT, including any contractually mandated information that Bombardier claims is proprietary or otherwise confidential.
- Institute an effective inspection and oversight program, including properly overseeing its quality assurance component, over subcontractors and sub-subcontractors.

² A First Article Inspection is an extraordinary inspection of the first one of any production component of the subway car that is produced.

NYCT's Response

NYCT agreed with 1 of 15 audit recommendations, disagreed with 4 recommendations, and stated that the remaining 10 recommendations were existing practices. NYCT specifically stated in its response that it “fundamentally disagrees with the audit conclusions in several respects. It is dramatically short-sighted of the audit to conclude that the completion of the Contract had been substantially delayed from the outset of the Contract in 2012. Further, in measuring the quality of Bombardier's performance and NYCT's oversight primarily on the basis of the original milestone dates, the audit fails to recognize the complexity of the typical rail vehicle design and manufacturing process and the valid reasons for delays that occurred including unforeseeable technical issues.”

Bombardier's Response

Bombardier agreed with each of the audit's five recommendations addressed to it. It further stated in its response that “[a]lthough Bombardier disagrees with certain statements contained in the draft audit report FP18-091A which contains numerous inaccuracies and subjective statements, we have decided to focus on the Comptroller's recommendations only.”

AUDIT REPORT

Background

The Metropolitan Transportation Authority (MTA) is North America's largest public transit system, serving a population of 15.3 million people within the 5,000-square-mile area extending from the five boroughs of New York City through Long Island, southern New York State, and Connecticut. NYCT is a subsidiary of the MTA, responsible for operating public transportation in New York City; this includes the New York City Subway, Staten Island Railway, and New York City Bus networks. The system connects the 5 boroughs of New York City, 24 hours a day, 7 days a week.

On June 4, 2012, as part of its efforts to modernize the subway system, NYCT entered into a \$599 million contract with Bombardier for the design, production, and delivery of 300 R179 subway cars. The R179 subway cars are intended to replace NYCT's existing fleet of R32 and R42 subway cars.³ By the time the Contract was entered into, the R32 and R42 subway cars had already passed their intended service life. The oldest cars are now nearly 55 years old; they are expensive to maintain and prone to breakdowns.

The scope of work and the technical requirements for the supply of subway cars and associated equipment are found within the Technical Specifications section of the Contract. The Contract imposes a milestone payment structure, which dictates that Bombardier will receive payments after it substantially completes each milestone. The milestones each represent a major advancement in the project, such as submission and approval of design documents; approval of test plans; submission of schedules and prototype components; completion of all inspections and tests; and delivery and acceptance of prototype cars. Under the Contract, Bombardier was required to substantially complete certain milestones before it could begin the actual delivery of the subway cars.

The Contract required NYCT to assign a Project Manager with authority to approve Bombardier's drawings, test procedures, subway car modifications, and payments. The Contract also required Bombardier to submit monthly updates on subway car production and projected completion dates to the Project Manager. NYCT entered into a separate contract with the engineering firm LTK, to provide project management support, engineering, and technical services, as well as administrative assistance from the start of the Contract in 2012 to the closeout period in 2020.⁴ In its contract with LTK, NYCT was required to pay the engineering firm an amount not to exceed \$17.9 million, which included technical salary costs for work performed, overhead rates, fixed fee percentages, and approved out of pocket expenses. Due to various issues and delays in the completion of the R179 Contract, additional consultant support was needed and the LTK contract was modified in 2016 to extend that contract to 2022 and to increase the contract amount by \$10.7 million to \$28.6 million.

Pursuant to the Contract, delivery of prototype subway cars was set to begin January 12, 2015, and the delivery of all 300 cars to NYCT property was to be completed by January 30, 2017. However, due to multiple issues, including manufacturing defects related to the welding and casting of train components, and delays in passing qualification tests, Bombardier failed to meet

³ The numbers given to the different train models are based on the contract number under which the cars were purchased.

⁴ LTK's original contract provided that it would be effective until the closeout of the R179 contract. The closeout period is approximately three years after the acceptance of the last car and thus, the LTK contract was anticipated to run until 2020 based on the original unfulfilled project completion date of January 2017.

its delivery deadlines. Delivery of subway cars did not begin on January 12, 2015, instead delivery began in September 2016. As of January 30, 2017, Bombardier had delivered only 18 cars.

In an attempt to mitigate the delays, in December 2016, NYCT approved a change order which allowed the early delivery of 16 subway cars before in-service tests were completed in order to assist in the training of NYCT personnel and testing. A year later, in December 2017, NYCT and Bombardier entered into the Settlement Agreement with Bombardier related to its failure to meet its delivery dates. The Settlement Agreement established a new delivery schedule for the balance of 300 cars still to be delivered, provided that an additional 16 cars would also be delivered in lieu of the remaining \$28.7 million in assessed liquidated damages, and allowed NYCT to retain the \$1.27 million in liquidated damages that it had already withheld when the first 10 trains had been delivered. This Settlement Agreement also provided that additional liquidated damages could be assessed against Bombardier in the event that it failed to meet the new February 2019 delivery schedule. In addition, the Settlement Agreement also provided that NYCT could request additional subway cars in lieu of liquidated damages.

As of the end of January 2019, Bombardier had again failed to meet the new delivery deadline having delivered only 162 of 316 cars pursuant to the settlement agreement. Based on NYCT's current forecast, completion of delivery is now expected by December 2019. As a result of this additional delay, NYCT exercised its right in accordance with the Settlement Agreement to request two additional cars at no cost. Thus, NYCT is presently entitled to receive a total of 318 subway cars from Bombardier. As of December 2019, NYCT reported that 298 subway cars had been delivered and of these, 278 were in service, and 20 were still going through acceptance testing.

The MTA has not provided a comprehensive assessment of the full cost of delays caused by Bombardier's ongoing failure to deliver the R179 subway cars as required by the Contract. However, in its 2016 Preliminary Budget, the MTA reported that "due to delays in the delivery of R179 replacement cars and increased revenue service fleet requirements" the continuing maintenance costs for R32 subway cars have increased by approximately \$50 million, consisting of an estimated "\$1.1 million in 2016, \$15.9 million in 2017, \$17.7 million in 2018 and \$15.5 million in 2019." More recently, pending the full delivery of the R179 cars and the retirement of 80 R32s in 2019, the MTA informed us that it has reduced its cost estimates from \$50 million to \$35 million based on revised estimates of lower maintenance costs as the R32 trains are finally taken out of service.

As of November 2019, NYCT has paid \$532 million to Bombardier of the \$599 million payment due pursuant to the R179 Contract. At the MTA's February 2019 Capital Program Oversight Committee Meeting, NYCT announced that the projected total budgeted cost of the R179 project is \$744 million, an increase of \$8.4 million above the budget estimate of \$735.6 million originally projected in 2012. In addition to the payments due to Bombardier, these budget estimates include the costs of in-house and consultant construction administration and NYCT labor costs.⁵

Even after the R179 trains were delivered and put in operation, cars had to be taken out of service on at least three different occasions starting in 2018 as a result of problems with the door controls, conductor's valve, and other major subsystems. When there are more than eight units⁶ "Unavailable for Service," the Contract allows NYCT to stop accepting delivery of R179 units. NYCT has invoked this Contract provision twice, once in August 30, 2018 and again in January 9, 2019, due to various issues such as problems with HVAC, doors, and air compressor unit.

⁵ Specifically, according to the MTA, the costs included in these estimates are: in-house design; consultant design; contract purchase; in-house construction; Transit Authority labor; in-house construction administration; and consultant construction administration (LTK).

⁶ A train unit consists of four or five subway cars.

Once problems with the cars were corrected, they were put back in service. However, in early May 2019, NYCT revealed that additional welding problems had been discovered on some of the cars delivered and put into operation on the J/Z and A/C subway lines. According to the MTA, these new welding issues were resolved by September 2019 and have not resulted in service interruptions.

Objectives

The objectives of this audit were to determine:

- whether NYCT adequately managed the Contract with Bombardier to ensure that it provided the deliverables within prescribed milestones and the approved schedule; and
- whether Bombardier complied with the provisions of the R179 Contract.

Scope and Methodology Statement

We conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives. This audit was conducted in accordance with the audit responsibilities of the City Comptroller as set forth in Chapter 5, §93, of the New York City Charter.

The scope of this audit was the inception date of the contract, June 4, 2012 to September 5, 2019. Please refer to the Detailed Scope and Methodology at the end of this report for the specific procedures and tests that were conducted.

Discussion of Audit Results

The matters covered in this report were discussed with officials from NYCT and Bombardier during and at the conclusion of this audit. A preliminary draft report was sent to NYCT officials and discussed at an exit conference held on September 5, 2019. A copy of the preliminary draft report was also sent to Bombardier and discussed during an exit conference held with company officials via conference call on September 25, 2019. Both NYCT and Bombardier were provided an opportunity to discuss the preliminary draft with the auditors and we took into consideration their comments and additional information provided when preparing the draft report. On October 31, 2019, we submitted a draft report to NYCT and Bombardier officials with a request for written comments. We received written responses from NYCT and Bombardier on November 19, 2019.

In its response, NYCT agreed with 1 of 15 recommendations, disagreed with 4 recommendations, and stated that the remaining 10 recommendations were existing practices. NYCT further stated in its response that it

fundamentally disagrees with the audit conclusions in several respects. It is dramatically short-sighted of the audit to conclude that the completion of the Contract had been substantially delayed from the outset of the Contract in 2012. Further, in measuring the quality of Bombardier's performance and NYCT's oversight primarily on the basis of the original milestone dates, the audit fails to recognize the complexity of the typical rail vehicle design and manufacturing

process and the valid reasons for delays that occurred including unforeseeable technical issues.

However, in focusing on “the complexity of the typical rail vehicle design and manufacturing process and the valid reasons for delays that occurred including unforeseeable technical issues,” NYCT attempts to minimize and deflect the audit’s documented findings of poor project management and inadequate oversight, including NYCT’s failure to enforce the Contract schedule in both the design and production phases of the contract. In fact, the audit’s conclusions were based on our extensive review of the communications between the principals of this Contract. Our careful assessment of these documents, as well as information provided through interviews of key personnel, led to our conclusion that Bombardier, a seasoned carbuilder, should have been able to manage the rail vehicle design and manufacturing process. Additionally, it should have been able to overcome technical issues without creating the considerable delays that occurred in the schedule. The communications between NYCT, Bombardier, and LTK clearly indicate that NYCT and LTK were frustrated by Bombardier’s inability to meet any milestone or any deliverable in a timely manner.

Moreover, it is apparent from NYCT’s response that it fails to recognize its complicity in the extensive and repeated delays in the completion of the Contract. From the Contract’s onset, NYCT did not take actions available under the Contract to ensure compliance by Bombardier with multiple contract terms, including the timely production of responsive designs. We fully recognize that milestones may have to be changed and that delays can occur when designing and producing subway cars. However, if NYCT had used all available contractual tools and more promptly exercised its authority, extensive delays could have been mitigated.

It should be noted that our review found that NYCT’s Project Manager and Consultant enforced rigorous quality and safety standards and did not accept deficient design documents, sub-standard components, and ensured the quality and safety of the rail vehicles being accepted for service.

In its response Bombardier agreed with each of the report’s five recommendations addressed to it. However, it stated, “Although Bombardier disagrees with certain statements contained in the draft audit report FP18-091A which contains numerous inaccuracies and subjective statements, we have decided to focus on the Comptroller’s recommendations only.”

The full text of NYCT’s and Bombardier’s responses are included as addenda to this report.

FINDINGS AND RECOMMENDATIONS

The audit found that from the commencement of work under the Contract in 2012, Bombardier failed to provide required deliverables that met Contract specifications within scheduled milestone dates. As a result, completion of the Contract has been substantially delayed from the outset and is currently more than 35 months behind schedule. The delivery of all subway cars is now estimated to be completed in December 2019, almost 3 years after its original delivery date of January 2017.

NYCT's Project Manager and LTK took efforts to rigorously enforce the contract's Technical Specifications to ensure that only train cars that meet NYCT's standards are put in service. However, although we found that NYCT conducted thorough inspections and testing of the finished products and held monthly meetings with Bombardier, NYCT failed to take sufficient efforts to ensure the timely production of acceptable deliverables in accordance with Contract specifications. At the end of 2017, NYCT assessed approximately \$30 million in liquidated damages due to Bombardier's delivery delays. In December 2017, NYCT agreed pursuant to the Settlement Agreement to withhold \$1.27 million in liquidated damages and negotiated the delivery of sixteen additional subway cars in lieu of payment of the balance of liquidated damages it claimed. Due to additional delays that occurred following the Settlement Agreement, NYCT exercised its right to request two additional subway cars, making the total number of subway cars to be delivered 318.

Overall, we found that Bombardier's failure to perform under the Contract was the result of its poor project management, which led to performance issues and the significant Contract delays that have occurred to date. In 2012, Bombardier did not comply with the contract requirements by failing to submit the welding procedures, a prioritization plan, and other required documents. Beginning in 2013, Bombardier failed to consistently produce acceptable work during the design stage which caused project delays. This was then followed by Bombardier's repeated failure to correct welding defects in critical structural components in a timely manner, which led to further substantial production delays. In addition, Bombardier did not adequately oversee its subcontractor's operations, which led to shipments of defective truck frame castings. These defective components needed to be repaired or replaced, which in turn slowed production. Finally, Bombardier's failure to conduct independent tests of the subway car components prior to the official tests with NYCT, led to numerous failed initial qualification tests.

In addition, we found that NYCT did not adequately exercise oversight of Bombardier's timely performance under the Contract. Specifically, NYCT did not take prompt and effective action in response to Bombardier's delayed and otherwise poor performance and overall lack of Contract compliance. NYCT did not enforce its contractual authority clearly and promptly. It failed to enforce the schedule requirements of the contract when Bombardier did not meet the scheduled milestones and the subway car contractual delivery schedule. Since 2013, NYCT has had substantial evidence of Bombardier's repeated failure to perform required work in a timely manner. Nonetheless, it was not until July 2016 that NYCT exercised its contractual right to request adequate assurance from Bombardier of its ability to complete the Contract, which required the submission by Bombardier of a detailed plan for project completion pursuant to Article 701(B). The audit also found that NYCT did not follow LTK's specific recommendation that it participate in future First Article Inspections for the casting supplier, for which a significant percentage of castings were found to have been improperly made. In addition, NYCT failed to formally evaluate Bombardier annually, and instead evaluated their performance under the Contract only in 2016, 2018, and 2019 in violation of internal NYCT vendor guidelines. Finally,

in connection with the 2016 evaluation, NYCT failed to immediately notify Bombardier of its marginal rating and instead waited almost two years before finally notifying them in 2018.

These matters are discussed in greater detail in the following sections of this report.

Bombardier’s Disregard for Key Contract Provisions and Poor Project Management Led to Extensive Delays

Due to poor performance and project management, Bombardier failed to meet its milestones in a timely manner. In particular, this audit examined the problems that Bombardier encountered in the following areas:

- Design Stage
- Welding
- Casting
- Qualification Tests

The following documented instances of Bombardier’s poor performance each significantly contributed to delays in the project.

Bombardier’s Substandard Compliance during the Design Stage

The Contract’s Technical Specification (TS) 19.3 details the requirements for Design Review. Specifically, TS 19.3.1 mandates that

A series of design review meetings . . . will be held in which the Contractor conducts a presentation in accordance with a previously approved agenda. In its presentation, the Contractor shall address design approaches, concepts, and design details for the vehicle(s), each system and subsystem and all associated test equipment. . . . Ten working days prior to a design review meeting, the Contractor shall submit 5 copies of the agenda and a data package covering information to be addressed in the meeting.

As detailed in the Contract, the design process includes an agreement between NYCT and the Contractor on the initial design concept and the creation by the Contractor of conceptual drawings acceptable to NYCT. This is followed by the development by the Contractor of the subway car design to include all components and subsystems. In order to expedite the design review and approval process, TS 19.1.4.3 requires the Contractor to “develop a comprehensive plan for prioritizing the review of submittals in cooperation with NYCT.” However, Bombardier failed to provide a Submittal Review Prioritization Plan as required by the Contract. The Submittal Review Prioritization Plan categorizes design submittals based on their importance to project activities. For example, a Submittal Review Prioritization Plan will set out which submittals must be reviewed and approved prior to the start of procurement, manufacturing, and vehicle testing activities. As a result, design review of submittals throughout the design phase did not proceed in an efficient manner and hindered identification of delays.

NYCT Response: “The audit report inaccurately stated that Bombardier did not submit this plan as required by the Contract, erroneously inferring that this led to delays. The major delay was precipitated by the welding hot cracking condition.”

Auditor Comment: NYCT's focus on the welding hot cracking conditions, discussed later in the audit report, in no way undercuts the fact that according to the TS in the Contract, the Prioritization Plan was due in August 2012 and that, as reported in a September 2013 letter from LTK to NYCT, the Prioritization Plan had not been submitted on time. Although in March 2014 NYCT eventually accepted a Contract Data Requirements List and Drawing list submitted by Bombardier in lieu of the Prioritization Plan, there is no statement or inference in the audit report that Bombardier's failure to submit a plan led to production delays. Rather, this failure by Bombardier to meet a 2012 Contract delivery date is noted because it speaks to Bombardier's lack of initial compliance with the contract and NYCT's failure to ensure Contract compliance from the outset of the Contract in 2012. Moreover, as stated by LTK in a letter to NYCT dated September 26, 2013 "Bombardier's failure to submit a Submittal Review Prioritization Plan as required by TS section 19.1.4.3 in time for prioritizing design review submittals created a void in managing submittals prioritization throughout the design review process and NYCT, therefore, believes that submittal review was not prioritized optimally."

Further, pursuant to TS 19.3.1.3, meetings are to be scheduled to conduct the In Process Design Review, which is defined as "a review of the design progress and the work performed in making the transition from conceptual design to final design." The Technical Specifications required Bombardier to maintain a continuous flow of high quality design submissions to NYCT including drawings, tests, mockups, software configurations, and pre-production units in order to go from concept to prototype in under three years. Bombardier, however, did not meet this schedule in part because of its repeated poor performance during the In Process Design Review. LTK's technical correspondence reflects that Bombardier came to meetings unprepared; submitted incomplete drawings; utilized what LTK described as "non-conservative" testing approaches; failed to address many advisory comments during resubmission; and generally produced work that did not comply with the Technical specifications, all of which delayed the design review and development processes.

In March 2013, as recommended by LTK, NYCT sent a letter formally notifying Bombardier of the repeated deficiencies in its work during the design review process. In July 2013, NYCT sent another notice to Bombardier, again criticizing Bombardier for multiple deficiencies and delays in the R179 project schedule. Among the issues highlighted by NYCT in that notice was "Bombardier's initial reluctance to provide appropriate documentation to support" the In Process Design Review, which NYCT states had a major delaying impact on the schedule. In a senior management meeting held, on August 23, 2013, NYCT raised performance issues with Bombardier. However, no minutes were taken of this meeting and there was no record of the issues discussed in a follow-up letter to Bombardier. This failure to memorialize the scope of the discussion between NYCT and Bombardier at this meeting resulted in no clear record of exactly what Bombardier was told about its performance deficiencies, if any warnings were given, or if any promises of corrective actions were made. Just a month later, in September 2013, LTK sent another letter to NYCT further detailing Bombardier's continuing Contract performance deficiencies, including, again, its inadequate approach to the In Process Design Review and its failure to undertake recommended corrective actions. However, as referenced above, NYCT did not always completely communicate all of its performance deficiencies to Bombardier in writing even though the design phase of the project was falling into delay.

Among the performance failures highlighted in NYCT's verbal and written notices to Bombardier were Bombardier's inadequate design submissions of the subway car bodies and trucks,⁷ which

⁷ "Trucks" refers to the framework beneath the subway car where the wheels and motor are located.

led to significant delays. The Carbody and Truck Stress Analysis Plans that Bombardier was required to prepare prior to production, were repeatedly rejected as deficient throughout 2013 because they did not comply with the Contract requirements.⁸ In particular, LTK found Bombardier's interpretation of the specifications and its welding analysis to be inadequate. As a result, by September of 2013, at the time the Carbody and Truck frame inspections should have been complete, the trucks and car bodies design was not yet finalized, which led to delays on the project.

In addition, the design of the subway car's software system was delayed due to Bombardier's substandard submissions of critical design and planning documents, including the Software Quality Assurance Plan (SQAP). The SQAP was crucial because it provided the software requirements and the overall plan for its design and integration. However, Bombardier's initial submission of the SQAP in 2012 was disapproved by NYCT, which stated that the quality of the SQAP documents were "not at an acceptable level." In 2013 and 2014, there were outstanding issues with the submission of software documents.

Bombardier's poor performance and delays in the design phase can be at least partially attributed to Bombardier's assumption that it could modify and submit a prior design that it had previously used for the production of R142 subway cars.⁹ Both NYCT and Bombardier stated in separate meetings with the auditors that this was a contributing factor for the delays. In a letter dated September 26, 2013 from LTK to NYCT, LTK states that "Bombardier's assertion that the R179 [In Process Design Review] requirements were interpreted based on the R142 experience is incredulous [*sic*] given the evolved R179 TS requirements and detailed communication of NYCT's expectations in this regard well ahead of the [In Process Design Review] phase."

As a result of Bombardier's failure to submit designs that conformed to the contract specifications, many of its initial design submissions were rejected by NYCT. These repeated rejections forced Bombardier to take additional time to create acceptable design submittals that met the R179 specifications. Bombardier's failure to initially produce designs that adhered to the Contract requirements delayed the design completion by approximately eight months. Furthermore, it had a cascading effect on future delays since other milestones were dependent on the completion of the subway car designs in order to proceed. Thus, Bombardier did not meet a majority of the Contract milestones in 2013.

Table I on the following page lists the expected completion dates of all the milestones according to the baseline schedule and the actual dates of completion. In 2013, Bombardier should have completed eight milestones. However, as reflected in Table I, it was only able to complete three. Further, as reflected in Table I, after 2013, the delays continued to increase.

⁸ A Stress Analysis Plan is a required computer analysis that examines how parts react to various stresses that could be encountered during their regular service life. Completion of this analysis of such a stress analysis plan is one of the tasks required before production can commence.

⁹ On April 30, 1997, the MTA awarded a contract to Bombardier and Kawasaki for the purchase of 680 R142 subway cars from Bombardier and 400 R142A subway cars from Kawasaki.

Table I
Comparison of Planned and Actual
Completion Dates of Project Milestones

Milestone	Description	Planned Completion Date	Actual Completion Date	Months Delay
A	Mobilization	06/04/2012	06/04/2012	0
B	Management Plan, Master Schedule, Reliability Program, Safety System Program, QA Plan	09/03/2012	09/27/2012	1
C	Software QA Plan, Software Configuration Control Master Test Plan, Contractor Data Requirement	08/03/2012	09/27/2012	2
D	Copies of Subcontracts for Subsystems	10/02/2012	07/31/2012	-2
E	Completion of Preliminary Design Review	02/04/2013	03/25/2013	1
F	Approval of General & Section Category Drawings	06/04/2013	11/20/2013	5
G	Approval of Car Mock-Ups	05/03/2013	11/20/2013	6
H	Approval of Stress Analysis & Compression Test Reports	12/04/2013	11/25/2015	23
I	Approval of Production Design Drawings	11/04/2013	01/30/2015	14
J	Approval of Critical Design Review	06/04/2013	02/26/2014	8
K	Completion & Acceptance of Inspection for First A&B Carbody Shells	09/04/2013	11/25/2015	26
K1	Completion & Acceptance of First Article Inspection For Truck Frame	09/04/2013	08/26/2016	See Below*
L	Completion & Acceptance of Inspection for First A&B Car Subsystems	11/04/2013	05/26/2016	30
M	Approval of Propulsion and Friction Brake Systems Performance Qualification Tests	05/04/2015	10/24/2016	17
N	Review of Complete A&B Cars	07/04/2014	02/26/2016	19
O	Delivery of First Two Five Car Units	01/12/2015**	11/22/2016	22
P	Completion & Acceptance of Car Qualification & Performance Tests on Units 1,2,5, and 6	08/04/2015	See Below***	
Q	Completion of Acceptance Tests for Each Unit	02/06/2017	Ongoing	
R	Successful Completion of Acceptance Tests of the 16 th , 40 th Cars, as well as Units 1 and 2	01/04/2016	See Below****	

* Milestone K was split into K and K1 as per a Change Order executed on 11/24/2015.

**21 days of excused delay were granted due to pilot strike.

***Milestone P was split into P1, P2, and P3, due to the settlement agreement. Each had completion dates of 12/27/2017; 01/08/2018; 3/26/2019, respectively.

****Milestone R was split into R1, R2, and R3, due to the settlement agreement. Each had completion dates of 01/08/2018; 5/25/2018; 3/26/2019.

Delays Resulting from Welding Issues

Pursuant to TS 15.23.6, which details the documentation required from Bombardier for welding,

All welding procedures and documents, including Welding Procedures Specifications [WPS], Procedure Qualification Records, and Resistance Spot Welding Schedules, shall be submitted for approval before application.

NYCT documents reflect that as early as August 15, 2012, NYCT requested that Bombardier submit the required welding procedures. However, notwithstanding the clear Contract requirements quoted above, Bombardier refused to submit the welding procedures to NYCT, claiming that these contained proprietary and confidential information due to their intrinsic value to the company. For almost two years, NYCT continued to press its request for the welding procedures and Bombardier continued to refuse to produce them. At the same time, Bombardier proceeded with welding without submitting the required procedures for approval. It was not until April 2014 that Bombardier began to finally submit all welding procedures as required by the Contract. However, this belated submission did not occur until four months *after* discovery of the welding problem that halted truck frame production.

NYCT Response: “NYCT takes exception to the audit report's inference that the welding issue was due to the belated submission of Welding Procedures.”

Auditor Comment: The audit report does not state or infer that the welding problems arose as a result of the belated submission of welding procedures. Rather, this report notes as a matter of fact that the Contract unequivocally requires submission by Bombardier of the welding procedures prior to the beginning of work, and that this was not done. Accordingly, Bombardier, in direct violation of the Contract, applied its welding procedures before submission to NYCT and NYCT was ineffective in ensuring compliance with these contract requirements.

Bombardier first discovered the welding problem in December 2013 but did not report it to NYCT until February 2014. Bombardier described the issue to NYCT as “hot cracking,” which it said is the formation of shrinkage cracks during the solidification of the weld material. This defect was discovered within a weld joint of the truck bolster.¹⁰ Since the problem was discovered during the production of the truck frame, production had to be halted until the issue was resolved. Ultimately, the production was halted twice, first from December 2013 when the cracks were discovered, until June 2014; and then again from September 2014 when the cracks reappeared, until November 2014. It was not until July 2015, 18 months after the initial discovery of the cracks that the welding solution was formally approved.

NYCT Response: “The welding defects found in critical structural components were fully resolved in November 2014 (not July 2015 as inaccurately reported by the audit).”

Auditor Comment: The date July 2015 is accurately reported by the audit report. The welding solutions were formally approved in a NYCT letter dated July 6, 2015.

¹⁰ A “truck bolster” is a structural element that connects the truck frame to the car body underframe and distributes the load.

Table II summarizes the welding issues and their timeline, starting with NYCT's initial request for the welding specifications and ending with the final resolution of the welding issues.

Table II

Welding Issue Timeline

Date	Description
August 2012	NYCT requested Bombardier submit all welding procedures, as required by the TS and Bombardier refused claiming that it would not submit them because of the confidential and proprietary nature of the information.
December 2013	Bombardier discovered hot cracking in the truck frame and stopped production.
February 2014	Bombardier notified NYCT of the hot cracking problem.
March 2014	Production of cars was delayed by 50 working days due to Bombardier's defective welding process.
April 2014	Bombardier begins to submit portions of its welding procedures to NYCT as required by the Contract.
June 2014	New welding procedures were submitted and approved by NYCT, production of truck frames resumed with an interim inspection plan in place.
September 2014	Hot cracking reappeared in the welds and production was stopped again.
September 2014	NYCT determined that the defective welding process delayed the project by 13 months.
November 2014	Production to resume with an interim inspection plan in place and Bombardier continued to update welding procedures.
June 2015	Submission of all welding procedures was completed.
July 2015	NYCT approves Bombardier's solution for the Weld Hot Cracking.

Delays Resulting from Defective Castings

Bombardier did not adequately oversee the work of its casting supplier and its subcontractors to ensure the quality of the products produced. Further, Bombardier failed to ensure that its casting supplier and its subcontractors implemented an effective quality assurance program. As a result, work performed by the supplier and its subcontractors was found to be defective. Many of the castings were unusable and the need to repair and/or replace them ultimately caused additional delays in Bombardier's performance.

Bombardier's responsibility for the quality of all the work performed under the Contract is clear. According to TS 18.1.1 Quality Assurance Requirements,

The Contractor shall be solely responsible for all of the quality assurance functions required by this Contract. The Contractor shall assure Contract compliance by subcontractors and suppliers. Surveillance of subcontractors shall include sampling and review of products, records, procedures, processes, manufacturing operations and Quality Control methods.

The requirements imposed by TS 18.1.1 further describe the comprehensive scope of Bombardier's responsibility and specify that it must

implement a Quality Assurance (QA) Program to assure delivery of a quality product to the NYCT under the terms of this Contract. The elements of the program shall be imposed on the Contractor's entire organization and all manufacturers, subcontractors, and suppliers that perform Contract work. The QA Program shall assure that all aspects of the Contract are in conformance with the design, materials and workmanship requirements provided in this Specification and that those requirements shall be provided in a timely manner.

Bombardier contracted with a supplier to produce the truck castings and that supplier then subcontracted the production of the castings to another company. As noted, Bombardier did not adequately ensure the quality of the work performed and a significant percentage of the castings produced were found to be defective due to their high levels of porosity (small holes inside the material). When a part fabricated through the casting process is found to have excessive porosity, depending on the extent and location of the porosity, it might be usable as is or repairable. When the number of holes or the porosity levels exceed acceptable tolerance levels, the cast material is deemed defective and cannot be used.

In May 2015, at Bombardier's plant in La Pocatière, Canada, a large number of defective casting pieces were discovered that had been shipped from Turkey. This led to the rejection of great numbers of castings because they could not be used for production without first being repaired. Initially, Bombardier officials informed NYCT that the company would manually repair them. However, due to the number of defective pieces and the time it took to repair them, Bombardier, working with its supplier, eventually found a solution to the production issues. New castings were produced with acceptable levels of porosity reducing the need for repairs.

Bombardier, LTK, and NYCT records, including correspondence, inspection reports, trip reports, and presentations by LTK and Bombardier, reveal that the intolerable porosity levels and high rejection rates for the castings resulted from deficient quality control at Bombardier's supplier and its subcontractor. Notwithstanding clear Contract requirements, Bombardier did not properly oversee its supplier. In turn, the supplier did not properly perform inspections, and these defective castings passed the supplier's inspections. Due to the supplier's negligence, defective castings

were then shipped to Bombardier’s plant in Canada hindering assembly of truck frames and causing additional delays.

Delays Resulting from Continuous Failures of Qualification Tests

Concurrent with the welding and casting issues, Bombardier also failed numerous systems qualification tests between early 2014 through mid-2015. TS 17.3 mandates that

A comprehensive testing program shall be conducted on raw materials, components, subsystems, cars, Units, and 2-Unit trains to substantiate the design and performance requirements, to assure conformance to the Specifications; inclusive of reliability and maintainability requirements. . . . Qualification tests are typically one-time tests conducted to demonstrate compliance with Specification design requirements at operating and environmental extremes.

As stated in the TS 17.3 Test Program, all tests shall be conducted with witnesses from NYCT present, unless instructed otherwise. Even though according to TS 17.3.1.1, qualification tests are typically one-time tests, Bombardier repeatedly failed these tests the first time taken and then took over a year to finally pass individual tests. Table III below shows examples of qualification test failures and length of time it took to pass the tests.

Table III

Qualification Test Delays

System Test	1st Run (Failed)	2nd Run (Failed)	Test Pass Date	Number of Days to Pass Test
Event Recorder Software Test	03/09/2015		10/21/2015	226
Communication and Signs Electromagnetic Interference Test	02/10/2014	05/21/2014	1/7/2015	331
Doors 2 Million Cycle Test	10/21/2014		05/20/2016	577
Doors Shock & Vibration Test	04/14/2015		08/18/2015	126
Brakes Electric Coupler Shock & Vibration Test	06/16/2014		10/15/2015	486

NYCT explained that the reason for the numerous failures of these tests was the lack of preparation by Bombardier and its subcontractors for the tests. NYCT stated that Bombardier conducted the tests for the first time in the presence of NYCT officials, rather than performing independent testing prior to the official tests. As reflected in NYCT’s records, the Qualification Test Program was to be completed by October 2014. Additionally, during an executive meeting in December 2014, “NYCT stated that it finds it concerning that the systems qualifications are not completed. It stated that if the Welding issues were not surfaced, most of the systems will not have been ready.” Of concern to NYCT was the fact that as per the baseline schedule the prototype delivery should have been completed by December 22, 2014.

NYCT Response: “The audit report implies that NYCT allowed cars to be shipped to NYCT without the required qualification (component, system and car level) testing to be completed and passed. This is grossly incorrect. Although subway car components failed

numerous qualification tests, which led to delays, no cars were shipped to NYCT prior to passing the qualification tests.”

Auditor Comment: In its response to this finding, NYCT focuses on the location of the testing in a seeming attempt to deflect attention from the undisputed fact that Bombardier failed numerous system qualification tests. Not only is this a meaningless concern, the report does not make any statement regarding the location of the subway cars when the qualification tests took place. Rather, the report plainly states that “Bombardier conducted the qualification tests for the first time in the presence of NYCT officials, rather than performing independent testing prior to the official tests.”

NYCT Did Not Exercise Article 701 “Event of Default” When Bombardier Failed to Meet Its Scheduled Milestones and Other Contract Requirements

As described above, our audit found significant issues that resulted in delays and Bombardier repeatedly missing milestones between 2013 and 2016. These issues included, in particular, multiple design submissions that did not comply with the Contract’s Technical Specifications that had to be resubmitted, as well as welding and casting problems.

As a result, Bombardier quickly fell behind in meeting Contract milestones. In particular, the Contract required that the first two train units consisting of five cars each (the prototypes) be delivered by December 2014 (January 2015 with the excused delay) and the 300th Subway car be delivered by January 2017, exclusive of excused delays. The Contract schedule required in service testing to be completed and train deliveries, totaling 300 subway cars in 18 months, to commence approximately eight months after the pilot car deliveries (July 2015). Production was originally projected to reach one car per day approximately eight months later (March 2016). It should be noted that the original testing and production schedule was never achieved after the pilot cars were delivered 22 months late.

However, notwithstanding early and persistent delays, it was not until July 2016 that NYCT took certain actions it was entitled to under the Contract when an “Event of Default” occurs. In particular, as described below, the audit found substantial evidence that an “Event of Default” occurred well before July 2016 and as a result, NYCT could have before that time requested written adequate assurance of Bombardier’s ability to perform in accordance with the Contract. Such a demand for adequate assurance would have required Bombardier to provide a detailed plan and schedule of its ability to perform the work of the Contract within a proposed delivery schedule to the satisfaction of the Project Manager.

Pursuant to Article 701(A) of the Contract,

An Event of Default shall mean a material breach of the Contract by the Contractor which, . . . shall include a determination by the Project Manager that: (i) performance of this Contract is unnecessarily or unreasonably delayed; (ii) the Contractor is willfully violating any of the provisions of the Contract Documents or is not executing the same in good faith and in accordance with this Contract; . . . or (vi) the Contractor has failed to provide “adequate assurance” as required under paragraph (B) hereof.

Further, Article 701(B) states that

When, in the opinion of the Project Manager, reasonable grounds for insecurity exist with respect to the Contractor's ability to perform the Work or any portion thereof, the [MTA] may request that Contractor, within a reasonable time, provide written adequate assurance of its ability to perform in accordance with the Contract.

When asked why NYCT did not "request adequate assurance" until July 2016, NYCT stated that it felt that during the first two years of the Contract, it was too early to invoke this default provision. NYCT officials further stated that they believed Bombardier would catch up during production, as had occurred with other vendors during previous contracts that had early delays.

However, engineering letters, reports, management letters, and statements from NYCT employees reflect that, in connection with its work on the R179 Contract, Bombardier did not perform at a level expected of an experienced carbuilder or a company that had previous dealings with NYCT. Bombardier's designs were repeatedly rejected because they did not comply with the Technical Specifications. Further, based on its previous contracting experience with NYCT, Bombardier should have better prepared the required contract documents and promptly submitted them to NYCT for approval, prepared for the mandatory tests of its work products, and generally been able to adhere to the Contract requirements. Indeed, in highlighting certain Bombardier performance deficiencies, NYCT stated,

Bombardier has requested an inordinate amount of interactive working sessions to discuss design details and review comments, which consumes critical NYCT resources. The majority of these sessions should not be required by a seasoned Carbuilder.

Notwithstanding NYCT's Project Manager's repeated expressions of concern, Bombardier's performance did not improve.¹¹

Our audit found that reasonable grounds for insecurity existed to invoke Article 701. Of particular significance are the following findings:

- In 2013, substandard submittals resulting from Bombardier challenging or ignoring clear specification requirements that created protracted submittal reviews, required additional technical working sessions, and created multiple correspondences.
- Early 2014, when the hot cracks discovered in the truck frames evolved into a major issue affecting the entire project.
- In September 2014, when the second set of welding cracks was observed, creating a serious concern about Bombardier's ability to fabricate the truck frames in a production environment without hot cracks.
- In 2015, when the casting issue was discovered and it affected Bombardier's ability to ramp up production and meet the schedule.

However, notwithstanding the foregoing, a request for adequate assurance was not authorized by NYCT senior management until July 2016 when Bombardier was close to delivering pilot cars and significant delays had been occurring for years.

NYCT Response: "The report overstates the significance of the early events on the project, understates the impact of the actual events leading to most significant delays,

¹¹ Bombardier's deficiencies were noted in, among other places, letters it received from NYCT and LTK to Bombardier dated: 3/7/13, 4/15/13, 7/17/13, 8/12/13, 9/26/13, 3/28/14, 9/24/14, and 8/26/15.

and dramatically underestimates the ramifications of invoking 'Default' on a contract of this technical nature.”

Auditor Comment: The report does not overstate, understate, or underestimate any specific event that led to delays. Instead, it presents a timeline of all events that caused significant delays, which potentially could have led to a request for adequate assurance.

NYCT had never previously requested adequate assurance for this type of contract and has no written procedures for the request of adequate assurance stating when and how to request it. Thus, it took years for NYCT to make a decision to request adequate assurance in 2016. It should be noted that NYCT has subsequently instituted changes in the new R211 contract to increase the amount of liquidated damages, reserve the right to declare default for assessment of liquidated damages equal to five percent of the total contract price or if there is a five month delay in the delivery date of the first four R211T units.¹²

NYCT Did Not Follow Certain Key LTK Recommendations

In 2013, prior to the discovery of the casting defect, LTK visited the Bombardier supplier responsible for castings to observe the First Article Inspections of cast parts in its role as NYCT's representative. While there, LTK observed quality issues and recommended that NYCT participate in future First Article Inspections for this supplier. However, NYCT did not follow LTK's recommendation. Notwithstanding the casting problems that were discovered in 2015, this supplier, located in Slovenia, was not inspected again by LTK until 2017. Following this 2017 visit to the casting supplier, LTK recommended that NYCT consider, at a minimum, one additional trip to audit the supplier. However, NYCT did not formally respond to LTK's recommendation and did not perform this audit. As described above, the defective castings significantly contributed to Bombardier's inability to meet the agreed upon schedule. Bombardier did not possess enough quality castings to ramp up production rates.

While Bombardier is ultimately responsible under the Contract for the work performed by its supplier and its subcontractors, Contract TS 18.1.2.1 provides that “[t]he NYCT shall have the right to visit facilities of the Contractor and subcontractors to assess their quality assurance programs.” However, NYCT did not take steps to proactively ensure that Bombardier's suppliers and their subcontractors implemented a quality assurance program that assured product compliance with the specification requirements. In light of the quality problems that emerged after Bombardier progressed past the design phase of the contract, NYCT was aware of potentially significant quality assurance issues in connection with its performance under the Contract. Moreover, there was a public record of Bombardier having subcontractor-casting issues in connection with an earlier contract it had with the Chicago Transit Authority for the production of train cars. With this knowledge, NYCT was on notice that there was an increased need for it to take additional action to ensure the adequacy of Bombardier's and its supplier's quality assurance programs.

NYCT Response: “The audit report implies that NYCT not attending the future First Article Inspections (FAIs) and Pre-shipment Inspections (PSIs) of Bombardier's casting supplier, as recommended by LTK, directly led to the casting problems and the subsequent delays. That is an extreme stretch of causation and logic. Bombardier was responsible for

¹² The R211 contract is for the design, production, and delivery of 535 new subway cars. The 535 subway cars are comprised of 440 “B” Division Subway Cars (R211A), 75 Staten Island Railway Cars (R211S), and 20 open gangway “B” Division Subway Cars (R211T).

ensuring that its supplier provided castings of high quality and in compliance with contract requirements.”

Auditor Comment: The audit report does not state or imply a direct connection between NYCT’s lack of attendance at the FAIs and the subsequent casting issues. Rather, the report simply states that the recommendations put forth by LTK in this regard were not followed. The facts stated in this report clearly indicate that NYCT should have taken a more proactive approach as it relates to the casting process in particular.

NYCT Did Not Conduct Annual Performance Evaluations of Bombardier

NYCT utilizes an internal vendor evaluation system known as VENDEVAL to track and evaluate vendors for rolling stock (trains) engaged in contracts valued at \$100,000 or greater. The VENDEVAL worksheet instructions sent to Project Managers provide that “contracts should be evaluated annually until they are completed.” In addition, VENDEVAL requires that when a vendor is given a rating of “Marginal” or “Unsatisfactory” the evaluator must notify that vendor of its rating in order to “afford the vendor an opportunity to correct or present its position concerning items that were reported to be deficient.” Evaluations are an important tool for NYCT to inform its vendors of the performance issues that are on record with NYCT and to document that poor performance in a central location so that it can be considered in the event that the vendor bids on future work.

However, we found that NYCT did not conduct annual evaluations as required by its internal guidelines. Rather, it only evaluated Bombardier’s performance of the R179 contract in 2016, 2018, and 2019. In addition, even though Bombardier’s overall rating in the 2016 evaluation was “Marginal,” NYCT failed to notify Bombardier of this rating until August 2018 and only after we inquired as to whether Bombardier had been informed of the evaluation in connection with this audit. The NYCT Project Manager explained his failure to conduct annual evaluations by stating that the Procurement Unit is responsible for sending the vendor evaluations to the Project Managers and that he only completed the ones received.

NYCT Response: “Though these official forms were not completed for certain years of the project, Bombardier was well advised of NYCT’s view that its performance was marginal and/or unsatisfactory through the numerous official NYCT correspondence that was transmitted to Bombardier and during meetings held with Bombardier.”

Auditor Comment: Evaluations are official documents that summarize the performance of the vendor in question, and are required by internal NYCT guidelines to be completed on a yearly basis. No matter how “well advised” NYCT believes Bombardier was of its marginal and/or unsatisfactory performance, the required evaluations would have served as official records. Accordingly, their official notification of their marginal rating could well have helped to motivate Bombardier to improve its performance.

RECOMMENDATIONS

In connection with all of its contracts, NYCT should:

1. Enforce its contractual authority clearly and promptly by effectively utilizing all of the mechanisms afforded under its contracts, including requests for adequate assurance and declarations of default when the contractor fails to abide by contractual requirements, such as adhering to Technical Specifications and missing early design milestones.

NYCT Response: “This is a NYCT existing practice. Throughout the entire R179 contract NYCT enforced, and continues to enforce, the technical, commercial, and schedule requirements of the contract. The R179 vehicles delivered to NYCT fully comply with the technical contract requirements. NYCT took the appropriate actions by not accepting inferior vehicles (defective castings, welding hot cracking, non-compliant equipment or vehicles), and ensuring complex technical issues were fully resolved per the Contract.”

Auditor Comment: As reflected in the audit report, NYCT did not enforce its contractual authority clearly and promptly. It failed to enforce the schedule requirements of the contract when Bombardier did not meet the scheduled milestones and the subway car contractual delivery schedule.

2. Institute written guidance and procedures for NYCT management to follow on the timing and the steps to be taken when requesting adequate assurance and/or declaring default.

NYCT Response: “NYCT disagrees with the recommendation. Based on the dynamic nature associated with the design, development and production stages of a car contract, the steps taken when requesting adequate assurance and/or declaring default cannot be instituted into a standardized guideline or procedure. Instead, continued communication and documented correspondence between Project Management, Procurement, Legal and Senior Management form the baseline for steps to be taken in the event a request for adequate assurance and/or declaring default is necessary.”

Auditor Comment: Regardless of the “dynamic nature associated with the design, development and production stages of a car contract” the contract clearly states under Article 701 the instances required for a request of adequate assurance or default to be justified. Written procedures for NYCT management on the timing and steps to be taken when requesting adequate assurance and/or default could only help and provide guidance in the future when situations such as the R179 contract arise that may require such consideration. Therefore, we continue to urge NYCT to implement this recommendation.

3. Ensure that contractors demonstrate an understanding of the specifications in the request for proposal prior to executing a contract. For instance, NYCT should consider seeking a conceptual design from the contractor prior to awarding the contract.

NYCT Response: “NYCT disagrees with the recommendation. For the acquisition of subway cars, including the R179 contract, NYCT uses a best value competitive procurement process which involves issuing a Request for Proposal (RFP). The RFP includes contract terms and conditions, a technical specification and performance requirements. All proposers, including Bombardier on the R179, are required to submit a technical proposal which describes in detail how they would comply with the technical specification. Technical proposals typically include structural sketch, renderings, interior

layouts, of sufficient detail to demonstrate that the proposer understands the project requirements. Multiple technical meetings are held with all proposer teams during the procurement process to ensure that all teams have a complete understanding of the technical requirements prior to completion of negotiations and selection of a recommended contract awardee. Securing a conceptual design is not necessary prior to award given the rigorous contractual requirements for detailed design to be developed by the Contractor in the immediate post-award phase of the contract. In addition, within two weeks after award a detailed specification review is held with all major subcontractors and suppliers. It should be noted that, at the time of this contract, Bombardier, an experienced car designer and builder, had successfully built over 1,800 cars for NYCT.”

Auditor Comment: As stated in the report, “Bombardier’s poor performance and delays in the design phase can be at least partially attributed to Bombardier’s assumption that it could modify and submit a prior design that it had previously used for the production of R142 subway cars Bombardier’s failure to initially produce designs that adhered to the Contract requirements delayed the design completion by approximately eight months.” This issue demonstrates a basic conceptual misunderstanding that was not addressed early on.

4. Modify the condition for default in future contracts to include that repeated failure to comply with the requirement to submit all technical procedures prior to start of work, will result in default.

NYCT Response: “NYCT disagrees with the recommendation. All contracts have negotiated terms and conditions, the acceptance of which carries risks for both parties. Default provisions that can be invoked for not providing deliverables prior to the start of a contract would impose a risk or cost a contracting party would not accept. Default is reserved for a material breach of the contract; whereas, liquidated damages are provided to offset losses (cost of delays) due to a contractor's performance. In the case of the R179 contract, liquidated damages are being assessed to the maximum extent allowed by the contract.”

Auditor Comment: The recommendation is not to invoke a default provision prior to the start of a contract, but for repeated failure to submit all required technical procedures as per an agreed upon schedule prior to the start of the work (e.g. welding). We continue to urge NYCT to implement this recommendation.

5. Where contracts require approval of plans or other items prior to the commencement of work on specific contract items, enforce the contracts so that no work may be started by the contractor prior to receiving written approval from NYCT.

NYCT Response: “NYCT disagrees with the recommendation. All contractually required documents, drawings, data and procedures/plans must be submitted for NYCT's approval. However, there are instances whereby the contractor may elect to start work prior to receiving written approval from NYCT as a means of mitigating potential impacts to the schedule, such as the ordering of contractually defined materials with long lead times. Under those circumstances, the contractor proceeds with the work at the contractor's own risk.”

Auditor Comment: The requirements of the contract should be adhered to by the vendor, and if they are not, NYCT should enforce the contract requirements. By allowing contractors to begin work prior to approval, NYCT is also taking a risk in delaying the

project if the contractor performs unauthorized work that eventually cannot be accepted. Therefore, we continue to urge NYCT to implement this recommendation.

6. Institute policies and procedures to be followed by NYCT when working with project management consultants such as LTK. Procedures should require documentation by NYCT of areas where it did not follow recommendations, agree with opinions or communicate deficiencies noted by the consultant.

NYCT Response: “This is a NYCT existing practice. All communications, both written and verbal, between NYCT and its subway car project management consultants, are documented and maintained in the NYCT project folder. Any deviation from the consultant's recommendation can be gleaned from those documents.”

Auditor Comment: Contrary to NYCT's claim that it maintains “[a]ll communications, both written and verbal, between NYCT and its subway car project management consultants, are documented and maintained in the NYCT project folder.”, during our review we specifically did not observe documentation of NYCT's decision to not follow LTK's recommendations in 2013 that it participate in future First Article Inspections for a casting supplier, and in 2017 for one additional trip to audit the supplier. We continue to urge NYCT to fully implement this recommendation.

7. Conduct annual vendor evaluations in accordance with internal guidelines, including promptly informing the vendor of the results where they receive ratings of either “Marginal” or “Unsatisfactory.”

NYCT Response: “This is a NYCT existing practice. Though these official forms were not completed for certain years of the project, Bombardier was well advised of NYCT's view that its performance was marginal and/or unsatisfactory through the numerous official NYCT correspondence that was transmitted to Bombardier and during meetings held with Bombardier.”

Auditor Comment: Evaluations are official documents that memorialize the performance of the vendor in question, and are required by internal NYCT guidelines to be completed on a yearly basis. Meetings and NYCT correspondence are not a substitute for formal evaluations of the vendor's performance. We continue to urge NYCT to fully implement this recommendation.

8. Promptly and consistently communicate all performance deficiencies reported by its consultants regarding contractors in writing, including memorializing in writing all notices of deficiencies that are communicated verbally so that there is a clear performance record for consideration in the event of default and/or if the contractors bids on new work.

NYCT Response: “This is a NYCT existing practice. NYCT persistently and dutifully notified Bombardier of deficiencies, whether reported by the consultant to NYCT or observed by NYCT. This information remains on file comprising a clear performance record if the contractor is being considered for new work.”

Auditor Comment: The audit found that NYCT did not always communicate all performance deficiencies noted by LTK to Bombardier. In at least one instance, September 2013, LTK sent a letter to NYCT detailing Bombardier's continuing Contract performance deficiencies, including its inadequate approach to the In Process Design Review and its failure to undertake recommended corrective actions. However, the letter sent to

Bombardier by NYCT did not contain all of this information. Therefore, we continue to urge NYCT to fully implement this recommendation.

9. Clearly document high-level communications such as executive level meetings with the vendor through minutes.

NYCT Response: “NYCT agrees with the recommendation. NYCT will develop a protocol to memorialize the outcome of high-level communications with the vendor.”

10. Conduct a sample review of subcontractors and sub-subcontractor’s quality assurance programs to ensure they are in compliance with the contract.

NYCT Response: “This is a NYCT existing practice. NYCT's Quality Assurance Group has policies in place and continues to review the quality assurance programs to ensure contractual compliance, including conducting sample reviews and site audits of contractors, subcontractors and sub-subcontractors.”

Auditor Comment: We only received NYCT Quality Assurance reports conducted at Bombardier’s North American plants. We did not receive any evidence that NYCT reviewed quality assurance reports for any sub-contractors or sub-subcontractors. Therefore, we continue to urge NYCT to fully implement this recommendation.

In connection with the R179 Contract, NYCT should:

11. Take all appropriate measures to enforce contractual warranty terms on all deliverables.

NYCT Response: “This is a NYCT existing practice. NYCT's New Car Warranty Group has policies in place and continues to monitor and enforce the contractual warranty terms on all deliverables for subway car contracts.”

12. Continue to withhold the proper amount of retainage in accordance with the Contract’s milestone payment requirements.

NYCT Response: “This is a NYCT existing practice. NYCT withheld the proper retainage (5%) on every milestone payment made and will continue to withhold proper retainage amounts as detailed in the R179 contract.”

13. Enforce all settlement agreements entered into in connection with the Contract.

NYCT Response: “This is a NYCT existing practice. NYCT will continue to enforce all settlement agreements in connection with the Contract.”

14. Continue to evaluate Bombardier for the duration of the Contract.

NYCT Response: “This is a NYCT existing practice. NYCT continues to monitor and evaluate Bombardier's performance.”

Auditor Comment: Future evaluations of Bombardier should be officially submitted in writing as required by internal NYCT evaluation guidelines.

15. Assess liquidated damages for any future delays in delivery of units beyond the final agreed delivery date.

NYCT Response: “This is a NYCT existing practice. NYCT will continue to assess liquidated damages as specified in the Contract.”

Bombardier should:

1. Strictly adhere to the requirements of the Contract and all subsequent settlement and other agreements with NYCT for the production of the R179 subway cars.

Bombardier Response: “Bombardier agrees with the recommendation in principle. Every step of the way, we have taken all decisions and actions with the goal of satisfying our customer and meeting the requirements of the R179 Contract and all subsequent agreements and settlements entered into with NYCT for the R179 subway cars. Bombardier has always been transparent with NYCT on its intention to re-use the design of the R142 subway cars for the R179 project and that intention was communicated to NYCT, as early as the bid stage as well as the start of the R179 project. Re-using service proven equipment is a true benefit and is de-risking any rail project both from a carbuilder’s and a transit agency’s perspective.”

Auditor Comment: As detailed throughout the report, Bombardier did not meet the requirements of the R179 Contract by failing to submit satisfactory initial design submissions and timely revisions, required procedures in a timely manner, and meeting the contractual delivery schedule in both the original contract and settlement agreement.

2. Promptly and completely provide all information required under the Contract to NYCT, including any contractually mandated information that Bombardier claims is proprietary or otherwise confidential.

Bombardier Response: “Bombardier agrees conceptually with the above statement. Bombardier’s confidential information and product data are what differentiate us from the other entities in the market and provide us with a competitive advantage. As of today, Bombardier provided all information required under the R179 Contract to NYCT, including any contractually mandated information that Bombardier claimed was proprietary and confidential.”

Auditor Comment: As noted above, the required information was not always provided in a timely manner.

3. Manage projects for NYCT in accordance with approved schedules, including as they relate to all design, testing, qualification, training, and warranty requirements.

Bombardier Response: “Bombardier agrees with this statement. Bombardier manages projects with schedules approved by its customers. However, in the course of project execution, issues can and often do arise. Some issues are outside of the carbuilder’s control, e.g. force majeure events, even for the most seasoned carbuilder. When something does happen, Bombardier has no choice but to adapt to circumstances and take necessary actions to remedy the issues related to project extension. At all times Bombardier mitigated all impacts on the R179 project to the extent possible.”

Auditor Comment: During the project only 21 days were excused for force majeure events. As of December 2019, the project is approaching three years in delay.

4. Institute an effective inspection and oversight program, including properly overseeing its quality assurance component, over subcontractors and sub-subcontractors.

Bombardier Response: “Bombardier agrees with this statement and already has quality assurance programs in place. Strong quality assurance lead to prompt identification of

potential safety and quality issues for all our programs, such as the welding issue on the R 179 Contract, allowing, if required, an early implementation of corrective measures.”

Auditor Comment: In the R179 Contract, we found that Bombardier did not ensure that the quality assurance was appropriately implemented pursuant to the Contract in connection with the casting supplier. Thus, we continue to urge Bombardier to fully implement this recommendation.

5. Promptly and completely inform NYCT of problems identified in the quality of products produced in connection with the Contract.

Bombardier Response: “Bombardier agrees with this statement. Bombardier always acted with transparency, keeping NYCT informed about potential issues when the necessary information became available. Bombardier continuously worked with NYCT to ensure timely and adequate communication and to resolve issues. On all our contracts, if a quality issue is discovered, our non-conformity process is followed rigorously.”

Auditor Comment: As stated above, NYCT was not formally informed of the welding issue for two months after the discovery.

DETAILED SCOPE AND METHODOLOGY

We conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives. This audit was conducted in accordance with the audit responsibilities of the City Comptroller as set forth in Chapter 5, §93, of the New York City Charter.

The scope of this audit covers the contract between NYCT and Bombardier from June 4, 2012 to September 5, 2019.

To gain an understanding of NYCT contracting procedures, we reviewed the R179 Contract between NYCT and Bombardier, identifying all relevant terms and conditions, including the Technical Specifications and all attachments received from NYCT. We then abstracted these to make them easier to reference. We also reviewed relevant legal information, such as the Buy America Standards set by the Federal Transit Administration to gain an understanding of the necessary domestic content requirements.

To gain an understanding of the oversight responsibilities exercised by NYCT we conducted numerous walkthrough meetings with the Project Director, the Contract Administration Manager, Director of Quality Assurance, Manager of Quality Assurance, and Project Managers for Contract Deliverables, Electrical, Mechanical, and Systems Integration. Additionally, we met with employees of NYCT's engineering consultants, LTK including the Vice President of the New York Region, the Project Manager, and a Senior Analyst in charge of scheduling. Furthermore, we met with Bombardier to gain its insight into the project and its delays. We used these meetings to build an understanding of Bombardier and NYCT's contractual responsibilities.

To verify whether NYCT conducted annual evaluations we requested the evaluation procedures and requested copies of all Bombardier's R179 evaluations.

We requested and reviewed all change orders, excusable delays, payment transmittals, and monthly agendas for our scope period. Additionally we examined engineering documents related to the issues that caused the delay, as well as relevant files from LTK. We also examined the Master Program Schedule, and relevant lists of sub-suppliers from Bombardier. Furthermore, we inspected NYCT's internal Quality Assurance Audit Reports as well as diagnostic testing reports, and internal NYCT Quality Assurance trip reports pertaining to the R179 project.

Based on assertions that confidential and proprietary information was contained in records we sought from both Bombardier and NYCT, both entities initially refused to produce certain requested information and generally delayed production overall. As a result, it was necessary for the Office to issue a subpoena and enter into confidentiality agreements with both parties to retrieve all of the information requested, including the complete correspondence (e.g. letters, emails and all attachments) between NYCT, Bombardier, and LTK. In addition, we also requested and reviewed inspection reports done by subcontractors and outside testing agencies, as well as trip reports created by LTK. Additionally we analyzed publicly available information including news articles, and various public NYCT statements, including staff summaries, preliminary budgets, committee meeting summaries, and capital construction documentation. We abstracted these into visual timelines to more easily analyze the delay.



Metropolitan Transportation Authority

State of New York

November 19, 2019

Ms. Marjorie Landa
Deputy Comptroller for Audit
NYC Office of the Comptroller
One Centre Street, Room 1100N
New York, NY 10007

Re: Draft Report #FP18-091A (New York City Transit Authority's Oversight of its Agreement with Bombardier Transit Corporation for the Design, Production, and Delivery of the R179 Subway Cars)

Dear Ms. Landa:

This is in reply to your letter requesting a response to the above-referenced draft report.

I have attached for your information the comments of Andy Byford, President, NYC Transit, which address this report.

Sincerely,

A handwritten signature in black ink that reads "Patrick J. Foye". The signature is stylized and cursive.

Patrick J. Foye
Chairman and Chief Executive Officer

c: Helene Fromm, MTA Chief of Staff
Michele Woods, Acting Auditor General, MTA Audit Services

The agencies of the MTA

MTA New York City Transit
MTA Long Island Rail Road

MTA Metro-North Railroad
MTA Bridges and Tunnels

MTA Capital Construction
MTA Bus Company

Memorandum



New York City Transit

Date November 18, 2019

To Patrick Foye, Chairman, Metropolitan Transportation Authority

From Andy Byford, President

Re **Response to New York City Comptroller Draft Report #FP18-091A - Audit Report on NYCT's Oversight of Its Agreement with Bombardier Transit Corporation for the Design, Production, and Delivery of the R179 Subway Cars**

The following is a response to the City of New York Office of the Comptroller's draft report entitled "Audit Report on the New York City Transit Authority's Oversight of Its Agreement with Bombardier Transit Corporation for the Design, Production, and Delivery of the R179 Subway Cars FP18-091A" ("Audit Report") dated October 31, 2019.

INTRODUCTION

New York City Transit Authority (NYCT) entered into a \$599 million contract (the Contract) with Bombardier Transit Corporation (Bombardier) in 2012 for the design, production, and delivery of 300 R179 subway cars to replace the R32 and R42 subway car fleet, which are over 50 years old. The Contract required delivery of prototype subway cars in December 2014, and the delivery of all 300 cars by January 2017. However, due to numerous unforeseen technical issues, Bombardier failed to meet its car delivery deadlines. The current expected car delivery completion date is December 2019.

The City of New York Office of the Comptroller commenced an audit of the R179 project in November 2017 with the objective to determine whether:

- NYCT adequately managed the Contract with Bombardier to ensure it provided the deliverables within prescribed milestones and the approved schedule.
- Bombardier complied with the provisions of the R179 Contract.

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NYCT met with the audit team on numerous occasions and provided them with thousands of documents exchanged between NYCT and Bombardier that clearly demonstrate the numerous actions and due diligence taken by NYCT to ensure Bombardier's compliance with the R179 Technical Specification and the R179 Contract Terms and Condition, and that NYCT receives safe and reliable cars.

NYCT fundamentally disagrees with the audit conclusions in several respects. It is dramatically short-sighted of the audit to conclude that the completion of the Contract had been substantially delayed from the outset of the Contract in 2012. Further, in measuring the quality of Bombardier's performance and NYCT's oversight primarily on the basis of the original milestone dates, the audit fails to recognize the complexity of the typical rail vehicle design and manufacturing process and the valid reasons for delays that occurred including unforeseeable technical issues – for instance, Milestones H, K, L, N and O were directly impacted by the welding issue.

It is NYCT's position that the audit report presents information, data, figures, and conclusions that do not adequately reflect the R179 project life cycle and rationale behind the management decisions made. In every instance, NYCT focused on maintaining public safety, compliance with the technical specification, quality, and delivering safe and reliable R179 subway cars. No cars were delivered or put into service without passing all testing required by the Contract.

While NYCT acknowledges the significantly delayed delivery of cars, NYCT strongly disagrees that it did not adequately exercise oversight of Bombardier's performance under the Contract. On the contrary, NYCT used every project management tool at its disposal and took all appropriate action to ensure that all complex technical issues were fully resolved per the Contract and that liquidated damages were assessed accordingly. The report's bias towards defaulting Bombardier as the primary project solution demonstrates a fundamental lack of understanding by the audit regarding the complexity of rail vehicle contracts. The report seems to ignore the financial and service implications of such a decision, as well as how that action would affect the overall car market and future procurements. And, as the auditors were repeatedly informed, the

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default option was seriously considered but rejected because of the extensive additional delays to car delivery and resulting impacts to our customers.

At the end of January 2019, Bombardier had delivered 166 cars and by the end of September 2019, Bombardier had delivered 268 cars with 258 cars in service. As of November 1, 2019, there were 288 cars delivered with 268 in service.¹

ANALYSIS OF KEY AUDIT FINDINGS AND CONCLUSIONS

“Bombardier’s Disregard for Key Contract Provisions and Poor Project Management Led to Extensive Delays”

The audit report contends that Bombardier’s disregard for key contract provisions in the area of design, welding, casting and qualification testing led to extensive delays. However, the audit lost sight of the fact that the main delays were largely the result of challenging technical issues that created the need for time intensive research, failure analyses, corrective actions, and lab testing to satisfactorily resolve the technical problems encountered with due diligence. The design process on the R179 project followed a normal pace and procedure, in that carbuilders and agencies typically iteratively discuss and evaluate design approaches and resolution options. The design process in general rarely follows what appears to be a scripted or linear approach implied by project schedules, as evidenced by the documents reviewed in this audit, which included the Submittal Review Prioritization Plan. The audit report inaccurately stated that Bombardier did not submit this plan as required by the Contract, erroneously inferring that this led to delays. The major delay was precipitated by the welding hot cracking condition.

The report understates the significance of the unpredicted appearance of “hot cracking”. This welding issue would have never been discovered under normal circumstances in 2013 at this early stage of the project. NYCT takes exception to the audit report’s inference that the welding

¹ The audit report inaccurately stated that Bombardier had delivered 162 cars by the end of January 2019, and the report further incorrectly indicated that by the end of September 2019, 258 subway cars had been delivered and of these 238 were in service, and 20 were still going through acceptance testing.

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issue was due to the belated submission of Welding Procedures. Earlier submission of the Welding Procedures would not have led to the prevention of the hot cracking due to the complexity of the issue. Bombardier's own requirement to perform mechanical sectioning and inspection of a truck led to the discoveries of the welding issue. Since it was a safety and quality related issue, NYCT wanted to ensure that the production cars met all safety and quality standards. NYCT and its consultant, LTK, worked with Bombardier to resolve the welding issues, which took longer than anticipated. For passenger safety, time constraints were not placed on resolving the welding issue. The welding defects found in critical structural components were fully resolved in November 2014 (not July 2015 as inaccurately reported by the audit).² In addition, to address the defective truck frame castings, Bombardier implemented changes to improve the quality of the casting and qualified an additional supplier to mitigate delay.

The audit report implies that NYCT allowed cars to be shipped to NYCT without the required qualification (component, system and car level) testing to be completed and passed. This is grossly incorrect. Although subway car components failed numerous qualification tests, which led to delays, no cars were shipped to NYCT prior to passing the qualification tests.

NYCT's efforts throughout this project, notwithstanding the contractor's lateness, was and will continue to ensure that the R179 subway cars are manufactured in accordance with the specifications and will provide safe and reliable performance as a compliment to NYCT's existing fleet.

“NYCT Did Not Exercise Article 701 “Event of Default” When Bombardier Failed To Meet Its Scheduled Milestones And Other Contract Requirements”

The report overstates the significance of the early events on the project, understates the impact of the actual events leading to most significant delays, and dramatically underestimates the

² As noted in the audit report, in early May 2019, additional welding problems had been discovered on some of the cars delivered and put into operation. For these new welding issues, engineering analyses/simulations were created, and destructive structural tests and ultrasonic testing were conducted. All testing and evaluations met the technical requirements verifying the strength and structural integrity of the cars. The new welding issues were resolved by September 2019.

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ramifications of invoking “Default” on a contract of this technical nature. Prior to 2016, Bombardier proposed a series of mitigating actions to bring the completion of the delivery schedule within a year of the original date, such as accelerating production, and expediting testing and engineering reviews. These plans were credible based upon the remaining duration of the project and Bombardier’s previous performance on projects of similar size and complexity. However, NYCT’s position changed in early 2016, when Bombardier provided a new projected schedule showing substantial slippage. In mid-April of that year, NYCT senior and project management staff asked its consultant to assess the feasibility of canceling the Bombardier Contract. Different options were analyzed and discussed with NYCT, but it was ultimately determined that NYCT would receive cars more quickly by staying the course with Bombardier. As a result, NYCT opted to issue the letter of adequate assurance in July 2016 in order to establish a realistic delivery schedule and to assess liquidated damages upon the delivery of the first two units later that year.

In December 2017, NYCT and Bombardier entered into a settlement agreement that provided NYCT with sixteen additional subway cars in lieu of collecting the remaining \$28.7M in assessed liquidated damages for delayed delivery, and allowed NYCT to retain the \$1.27M in liquidated damages that NYCT had previously withheld. Additionally, the settlement agreement allowed for NYCT to request an additional car for every \$1.8M of liquidated damages accrued in the event further lateness occurred. NYCT opted for two additional cars at the cost of \$3.6M due to additional project delays.³ Therefore, to date NYCT has utilized the assessed liquidated damages to obtain eighteen additional R179 cars to increase the size of the R179 fleet. Thus, in lieu of \$32.4M in liquidated damages, NYCT acquired eighteen R179 cars, for a price per car of approximately \$1.8M. By contrast, if purchased today, the price per R179 car would be approximately \$2.6M per car. Thus, the settlement resulted in a discount to NYCT of \$800K per car, for a total savings of \$14.4M for the 18 cars.

³ The audit report inaccurately stated that NYCT exercised its right in accordance with the Settlement Agreement to request two additional cars at no cost.

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Under the circumstances, status, and progression of the R179 project, the application of liquidated damages was deemed the most logical remedy to the delay without incurring yet more loss of time created by a declaration of default, which would have further delayed the receipt of new vehicles for the riding public.

“NYCT Did Not Follow Certain Key LTK Recommendations”

The audit report implies that NYCT not attending the future First Article Inspections (FAIs) and Pre-shipment Inspections (PSIs) of Bombardier’s casting supplier, as recommended by LTK, directly led to the casting problems and the subsequent delays. That is an extreme stretch of causation and logic. Bombardier was responsible for ensuring that its supplier provided castings of high quality and in compliance with contract requirements. Once the quality incident was discovered in 2015, Bombardier took the required actions to address the quality issues at the supplier location, and the root cause analysis and corrective actions were thereafter tracked at the monthly quality meetings. In addition, Bombardier decided to substitute some complex castings with forgings in order to address reoccurring casting issues and qualify another supplier for manufacturing castings to assist in ramping up production. When a different quality issue with the same supplier involved in the 2015 quality incident was discovered in 2017, LTK recommended a follow-up audit due to the overall history of castings on the program. However, this recommendation became moot as Bombardier sent their own casting expert to oversee the situation and the casting quality eventually improved.

“NYCT Did Not Conduct Annual Performance Evaluations of Bombardier”

The audit report found that NYCT did not conduct annual evaluations as required by internal guidelines, and only evaluated Bombardier's performance of the R179 contract in 2016, 2018, and 2019. In addition, even though Bombardier's overall rating in the 2016 evaluation was "Marginal," NYCT failed to notify Bombardier of this rating until August 2018.

Though these official forms were not completed for certain years of the project, Bombardier was well advised of NYCT’s view that its performance was marginal and/or unsatisfactory

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through the numerous official NYCT correspondence that was transmitted to Bombardier and during meetings held with Bombardier.

RECOMMENDATIONS

NYCT reviewed the fifteen (15) recommendations for NYCT and has the following responses.

In connection with all of its contracts, NYCT should:

Recommendation 1. Enforce its contractual authority clearly and promptly by effectively utilizing all of the mechanisms afforded under its contracts, including requests for adequate assurance and declarations of default when the contractor fails to abide by contractual requirements, such as adhering to Technical Specifications and missing early design milestones.

NYCT Response: This is a NYCT existing practice. Throughout the entire R179 contract NYCT enforced, and continues to enforce, the technical, commercial, and schedule requirements of the contract. The R179 vehicles delivered to NYCT fully comply with the technical contract requirements. NYCT took the appropriate actions by not accepting inferior vehicles (defective castings, welding hot cracking, non-compliant equipment or vehicles), and ensuring complex technical issues were fully resolved per the Contract.

Recommendation 2. Institute written guidance and procedures for NYCT management to follow on the timing and the steps to be taken when requesting adequate assurance and/or declaring default.

NYCT Response: NYCT disagrees with the recommendation. Based on the dynamic nature associated with the design, development and production stages of a car contract, the steps taken when requesting adequate assurance and/or declaring default cannot be instituted into a standardized guideline or procedure. Instead, continued communication and documented correspondence between Project Management, Procurement, Legal and Senior Management form the baseline for steps to be taken in the event a request for adequate assurance and/or declaring default is necessary.

Recommendation 3. Ensure that contractors demonstrate an understanding of the specifications in the request for proposal prior to executing a contract. For instance, NYCT should consider seeking a conceptual design from the contractor prior to awarding the contract.

NYCT Response: NYCT disagrees with the recommendation. For the acquisition of subway cars, including the R179 contract, NYCT uses a best value competitive procurement process which involves issuing a Request for Proposal (RFP). The RFP includes contract terms and conditions, a technical specification and performance requirements. All proposers, including Bombardier on the R179, are required to submit a technical proposal which describes in detail how they would comply with the technical specification. Technical proposals typically include structural sketch, renderings, interior layouts, of sufficient detail to demonstrate that the proposer understands the project requirements. Multiple technical meetings are held with all proposer teams during the procurement process to ensure that all teams have a complete understanding of the technical requirements prior to completion of negotiations and selection of a recommended contract awardee. Securing a conceptual design is not necessary prior to award given the rigorous contractual requirements for detailed design to be developed by the Contractor in the immediate post-award phase of the contract. In addition, within two weeks after award a detailed specification review is held with all major subcontractors and suppliers. It should be noted that, at the time of this contract, Bombardier, an experienced car designer and builder, had successfully built over 1,800 cars for NYCT.

Recommendation 4. Modify the condition for default in future contracts to include the repeated failure to comply with the requirement to submit all technical procedures prior to the start of work, will result in default.

NYCT Response: NYCT disagrees with the recommendation. All contracts have negotiated terms and conditions, the acceptance of which carries risks for both parties. Default provisions that can be invoked for not providing deliverables prior to the start of a contract would impose a risk or cost a contracting party would not

accept. Default is reserved for a material breach of the contract; whereas, liquidated damages are provided to offset losses (cost of delays) due to a contractor's performance. In the case of the R179 contract, liquidated damages are being assessed to the maximum extent allowed by the contract.

Recommendation 5. Where contracts require approval of plans or other items prior to the commencement of work on specific contract items, enforce the contracts so that no work may be started by the contractor prior to receiving written approval from NYCT.

NYCT Response: NYCT disagrees with the recommendation. All contractually required documents, drawings, data and procedures/plans must be submitted for NYCT's approval. However, there are instances whereby the contractor may elect to start work prior to receiving written approval from NYCT as a means of mitigating potential impacts to the schedule, such as the ordering of contractually defined materials with long lead times. Under those circumstances, the contractor proceeds with the work at the contractor's own risk.

Recommendation 6. Institute policies and procedures to be followed by NYCT when working with project management consultants such as LTK. Procedures should require documentation by NYCT of areas where it did not follow recommendations, agree with opinions or communicate deficiencies noted by the consultant.

NYCT Response: This is a NYCT existing practice. All communications, both written and verbal, between NYCT and its subway car project management consultants, are documented and maintained in the NYCT project folder. Any deviation from the consultant's recommendation can be gleaned from those documents.

Recommendation 7. Conduct annual vendor evaluations in accordance with internal guidelines, including promptly informing the vendor of the results where they receive ratings of either "Marginal" or "Unsatisfactory."

NYCT Response: This is a NYCT existing practice. Though these official forms were not completed for certain years of the project, Bombardier was well advised of NYCT's view that its performance was marginal and/or unsatisfactory through the numerous official NYCT correspondence that was transmitted to Bombardier and during meetings held with Bombardier.

Recommendation 8. Promptly and consistently communicate all performance deficiencies reported by its consultants regarding contractors in writing, including memorializing in writing all notices of deficiencies that are communicated verbally so that there is a clear performance record for consideration in the event of default and/or if the contractors' bids on new work.

NYCT Response: This is a NYCT existing practice. NYCT persistently and dutifully notified Bombardier of deficiencies, whether reported by the consultant to NYCT or observed by NYCT. This information remains on file comprising a clear performance record if the contractor is being considered for new work.

Recommendation 9. Clearly document high-level communications such as executive level meetings with the vendor through minutes.

NYCT Response: NYCT agrees with the recommendation. NYCT will develop a protocol to memorialize the outcome of high-level communications with the vendor.

Recommendation 10. Conduct a sample review of subcontractors and sub-subcontractor's quality assurance programs to ensure they are in compliance with the contract.

NYCT Response: This is a NYCT existing practice. NYCT's Quality Assurance Group has policies in place and continues to review the quality assurance programs to ensure contractual compliance, including conducting sample reviews and site audits of contractors, subcontractors and sub-subcontractors.

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In connection with the R179 Contract, NYCT should:

Recommendation 11. Take all appropriate measures to enforce contractual warranty terms on all deliverables.

NYCT Response: This is a NYCT existing practice. NYCT's New Car Warranty Group has policies in place and continues to monitor and enforce the contractual warranty terms on all deliverables for subway car contracts.

Recommendation 12. Continue to withhold the proper amount of retainage in accordance with the Contract's milestone payment requirements.

NYCT Response: This is a NYCT existing practice. NYCT withheld the proper retainage (5%) on every milestone payment made and will continue to withhold proper retainage amounts as detailed in the R179 contract.

Recommendation 13. Enforce all settlement agreements entered into in connection with the Contract.

NYCT Response: This is a NYCT existing practice. NYCT will continue to enforce all settlement agreements in connection with the Contract.

Recommendation 14. Continue to evaluate Bombardier for the duration of the Contract.

NYCT Response: This is a NYCT existing practice. NYCT continues to monitor and evaluate Bombardier's performance.

Recommendation 15. Assess liquidated damages for any future delays in delivery of units beyond the final agreed delivery date.

NYCT Response: This is a NYCT existing practice. NYCT will continue to assess liquidated damages as specified in the Contract.

Saint-Bruno, November 19, 2019

Ms. Marjorie Landa
Deputy Comptroller for Audit
The Office of the City Comptroller
1 Centre Street
New York, NY 10038

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Re: Draft Audit Report FP18-O91A (New York City Transit Authority's Oversight of Its Agreement with Bombardier Transit Corporation for the Design, Production and Delivery of the R179 Subway Cars)

Dear Ms. Landa,

This is in reply to your letter requesting a response to the above-referenced draft audit report. The purpose of the audit performed by the Comptroller was to determine whether New York City Transit Authority ("NYCT") adequately managed the Contract with Bombardier Transit Corporation ("Bombardier") to ensure that it provided the deliverables within prescribed milestones and the approved schedule. The audit also examined whether Bombardier complied with the provisions of the R179 Contract.

Bombardier Transportation is a global leader in rail technology and offers the full spectrum of rail solutions, ranging from trains to sub-systems and signaling to complete turnkey transport systems, e-mobility technology and data-driven maintenance services. With 500 customers in 60 countries, we serve as a trusted and strong local partner all over the world. Every single day, 500 million passengers rely on our mobility solutions to stay on the move.

Participating in a program to modernize the New York subway system is complex and full of challenges for any experienced carbuilder. Great companies are the ones that take responsibility and react decisively, standing by their products. This is exactly what Bombardier has done during the R179 Contract.

As of November 18, 2019, we have produced 303 R179 subway cars, with another 15 to be completed by the end of December. In October we delivered 20 cars, representing the highest number of cars ever delivered to NYCT in a given month. We are fully committed to completing the overall delivery of all 318 R179 subway cars to NYCT by the end of this year and are proud of the fleet's performance.

Audit Recommendations

Recommendation #1: Bombardier should strictly adhere to the requirements of the Contract and all subsequent settlement and other agreements with NYCT for the production of the R179 subway cars.

BOMBARDIER

Bombardier Response: Bombardier agrees with the recommendation in principle. Every step of the way, we have taken all decisions and actions with the goal of satisfying our customer and meeting the requirements of the R179 Contract and all subsequent agreements and settlements entered into with NYCT for the R179 subway cars.

It is true to say that Bombardier had partially based its design on some elements of the R142 program. It is widely common in the rail industry to adapt a previously “service proven” product to answer a new Request for Proposal. Specifically, for R179, using a service proven design was, in Bombardier’s view, encouraged by NYCT. As for example, the documentation issued at the Best And Final Offer (BAFO) stage had been modified by NYCT to encourage the potential bidders to re-use as much as possible previous designs that had been approved by NYCT in past projects (see for example Article 901J of the Terms and Conditions).

Said article stipulates that NYCT will waive the R179 Contract “*requirements for any R179 system, Component or part for which the Technical Specification is the same, equal or essentially equivalent as the System, Component or part previously Approved in a prior NYCT Car Contract*”.

Bombardier has always been transparent with NYCT on its intention to re-use the design of the R142 subway cars for the R179 project and that intention was communicated to NYCT, as early as the bid stage as well as at the start of the R179 project. Re-using service proven equipment is a true benefit and is de-risking any rail project both from a carbuilder’s and a transit agency’s perspectives.

Recommendation #2: Bombardier should promptly and completely provide all information required under the Contract to NYCT, including any contractually mandated information that Bombardier claims is propriety or otherwise confidential.

Bombardier Response: Bombardier agrees conceptually with the above statement. Bombardier’s confidential information and product data are what differentiate us from the other entities in the market and provide us with a competitive advantage. It is therefore critical, for Bombardier, our partners, suppliers and customers, that we treat this information with a particular attention. As of today, Bombardier provided all information required under the R179 Contract to NYCT, including any contractually mandated information that Bombardier claimed was proprietary and confidential. Throughout the course of the project, with the support of NYCT, ways to communicate sensitive information needed to be found, while ensuring Bombardier’s trade secrets were protected.

Recommendation #3: Bombardier should manage projects for NYCT in accordance with approved schedules, including as they relate to all design, testing, qualification, training, and warranty requirements.

Response: Bombardier agrees with this statement. Bombardier strongly believes that it is not the sole party responsible for the delays in delivering the R179 subway cars to NYCT. Bombardier manages projects with schedules approved by its customers. However, in the course of project execution, issues can and often do arise. Some issues are outside of the carbuilder’s control, e.g. force majeure events, even for the most seasoned carbuilder. When something does happen, Bombardier has no choice but to adapt to circumstances and take necessary actions to remedy the issues related to project execution. At all times, Bombardier mitigated all impacts on the R179 project to the extent possible.

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Recommendation #4: Bombardier should institute an effective inspection and oversight program, including properly overseeing its quality assurance component, over subcontractors and sub-subcontractors.

Response: Bombardier agrees with this statement and already has quality assurance programs in place. Strong quality assurance lead to prompt identification of potential safety and quality issues for all our programs, such as the welding issue on the R179 Contract, allowing, if required, an early implementation of corrective measures. We have identified and are continuing to identify opportunities for improvement on an ongoing basis. During the course of the project, we dedicated a full-time resource, the Project Quality Assurance Lead, to ensure the quality of the cars delivered. Moreover, in January 2018, Bombardier launched the Quality Alert Escalation System to enable systematic recording, appropriate escalation, prioritization and effective resolution of quality-related issues. Recently, we also reinforced the Gate Review Process to give more decisional power to the Quality function. Despite all those actions being implemented to ensure a state-of-the-art quality assurance program, no entity is safe from extraordinary circumstances.

Recommendation #5: Bombardier should promptly and completely inform NYCT of problems identified in the quality of products produced in connection with the Contract.

Response: Bombardier agrees with this statement. Bombardier always acted with transparency, keeping NYCT informed about potential issues when the necessary information became available. Bombardier continuously worked with NYCT to ensure timely and adequate communication and to resolve issues. On all our contracts, if a quality issue is discovered, our non-conformity process is followed rigorously. The issue is carefully identified, well defined in terms of content, extent and seriousness. When required, a detailed root cause analysis is further performed with multidisciplinary teams. In parallel, emergency corrective actions are put in place rapidly. Bombardier has always acted in accordance with the R179 Contract regarding such information obligations.

In conclusion, this letter represents Bombardier's response to the Comptroller's recommendations. Although Bombardier disagrees with certain statements contained in the draft audit report FP18-O91A which contains numerous inaccuracies and subjective statements, we have decided to focus on the Comptroller's recommendations only. Finally, Bombardier, voluntarily did not provide any comments concerning the statements made on the December 2017 Settlement Agreement considering the application of the confidentiality protocol executed between Bombardier and The Office of the City Comptroller to such Settlement Agreement and the confidentiality provisions between Bombardier and NYCT.

Sincerely,



Marie-Claude Galarneau
Head of Commercial Management
Bombardier Transportation, Americas Region