1. Program Overview
2. Schedule
3. Equipment Changes
4. Operator Duties
5. Potential Gains
6. Questions
Train (line 4) are performed on Line 4, during Carhouse, dynamic tests (i.e., actually bringing the Static tests (i.e., tests done safely in a yard situation) are performed at Wilson Carhouse and Davisville Testing is currently in progress and mostly complete.

Hong Kong and Boston, to name just a few, with subway systems in major cities such as London, with a single train operator, the TTC will be up to date. The majority of subway systems worldwide operate can safely drive the train and operate doors.

Technology has developed so that one crew member removes the need for a guard on the train and allows one of the TTC’s key modernization efforts that What is OPTO? One-Person Train Operation (OPTO) is
TTC have communicated their intentions to implement OPTO Line 4 with ATU Local 13.

Using 4-car Toronto Rockets, service is scheduled to commence on October 9, 2016.

OPTO Revenue Service on Line 4 is once OPTO is successfully implemented on Line 4, the vision is to expand OPTO to Line 1 in 2019, and Line 2 in 2021. Line 3 has been operating during customer service hours.

Line 4 was selected as the initial deployment because there are only four trains for OPTO.
- Handheld portable radio for operator to maintain communications when leaving cab.

- Onboard equipment the correct side to open doors.

- Sensors mounted under truck reads proximity plate installed at track. Indicates significance reduces likelihood of wrong side door opening.

- Correct-side door enables (CSD) software to enable push buttons seated. Correct-side door enables left/right side allows safe open/close of doors while maintaining unobstructed view of track and signals.

- Train door monitoring system (TDMs) displays clear view of passenger doors while equipment changes to TR to support OPTO Line 4 include:

**EQUIPMENT CHANGES**
Emergency evacuation tunnel
8-car train
Propelling from the rear
Driver collapse

Note certain emergency processes now change with 1-person operation:
- Maintain communication with Transit Control Centre when outside of the cab.
- Stay vigilant to maintain awareness of all transit control communications.
- Identify, resolve customer and/or equipment-related incidents (station staff)
- Operate doors (using OPTO door controls)
- Monitor platform activity and customers exiting/boarding (using TDMS display)

Operator will be required to:
- Fundamentally unaltered. With TR equipment changes to support OPTO, the
  OPTO Removes the need for Guard. The Operator's primary duties remain

OPERATOR DUTIES
through an open window for 1.5 car lengths upon train's departure, or deliberately by passengers (that can occur when guards observe the platform). Also, OPTO promotes safer work conditions for operators as follows:

<table>
<thead>
<tr>
<th>Line 1</th>
<th>Rate</th>
<th># of Operators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line 2</td>
<td>113</td>
<td>11</td>
</tr>
<tr>
<td>Line 4</td>
<td>11</td>
<td>11</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gain</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>$27,5623.826</td>
<td>1.365 (Finishes)</td>
</tr>
<tr>
<td>$10,690.042</td>
<td>40 hrs x $33.32/hr x 52 wks x 160</td>
</tr>
<tr>
<td>$15,893.160</td>
<td>40 hrs x $33.32/hr x 52 wks x 160</td>
</tr>
<tr>
<td>$10,040.624</td>
<td>40 hrs x $33.32/hr x 52 wks x 160</td>
</tr>
</tbody>
</table>
Questions?
Procurement Authorization Amendment to Modify Toronto Rocket (TR) Trainsets to Accommodate One Person Train Operation

<table>
<thead>
<tr>
<th>Date:</th>
<th>July 11, 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>To:</td>
<td>TTC Board</td>
</tr>
<tr>
<td>From:</td>
<td>Chief Executive Officer</td>
</tr>
</tbody>
</table>

Summary

The Toronto Transit Commission’s Five Year Corporate Plan includes the implementation of One Person Train Operation (OPTO) which will be implemented on all subway lines. The SRT Line 3 has operated under OPTO mode since opening in 1985.

A change directive was authorized to Bombardier Transportation Canada Inc. (Bombardier) in the amount of $2,734,822.98 including taxes, for the engineering design of a prototype Train Door Monitoring (TDM) system and Correct Side Door Enable (CSDE) system on a Toronto Rocket (TR) train for a functional test.

A contract amendment in the amount of $2,260,893.46 followed for the installation of the prototype TDM and CSDE systems on a TR train.

On February 18, 2016, a test of the TDM and CSDE systems were successfully conducted at Bessarion Station on Line 4 using a 4-car TR trainset. Based on this successful demonstration, it is planned to modify six 4-car TR trainsets on Line 4 for OPTO implementation in 2016. This would be followed by implementation of 76 x 6-cars TR trainsets for OPTO implementation on Line 1.

A contract amendment to Bombardier in the amount of $38,463,069.25 CDN, inclusive of all applicable taxes, is required for these modifications to the TR train fleet.

Recommendations

It is recommended that the Board authorize:

1. A contract amendment to Bombardier, in the amount of $38,463,069.25 CDN, inclusive of all applicable taxes, for the installation of the TDM and CSDE on the entire TR fleet of 82 trains to facilitate OPTO operation on Line 4 and Line 1.
Financial Summary

To proceed with the One Person Train Operator initiative, work must be completed both on-board the subway trains and on the subway platforms. The current approved 2016-2025 Capital Budget includes $68.7 million for this work as shown in the table below. Current estimates are that only $62.6 million will be required to complete this work yielding a reduced estimated final cost of $6.1 million. These changes will be reflected in the 2017-2026 Capital Budget submission.

<table>
<thead>
<tr>
<th>Train Door Monitoring</th>
<th>Current 2016-2025 CB ($ millions)</th>
<th>Proposed 2017-2026 CB ($ millions)</th>
<th>Change ($ millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.3 Communications</td>
<td>12.2</td>
<td>12.8</td>
<td>0.6</td>
</tr>
<tr>
<td>(Subway Platforms)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.16 Subway Car Overhaul</td>
<td>56.5</td>
<td>49.8</td>
<td>(6.7)</td>
</tr>
<tr>
<td>(Trains)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total EFC</td>
<td>68.7</td>
<td>62.6</td>
<td>(6.1)</td>
</tr>
</tbody>
</table>

The present Line 4 workforce roster is 30 train operators for 7 days/week service. OPTO will reduce the train crew size by 50% to 15 operators by changing from 2 crew members (operator and guard) to one crew member (operator only). However, four additional crew members would be required for a single step back at Sheppard Station after each round trip. The step back helps provide resilience to the train service schedule, by compensating for the additional time required for an operator to walk from one end of train to the other at both end terminals. Under OPTO the roster will be 19 operators with a reduction of 11 crew members. The average cost of an operator is approximately $103,400/year including fringe benefits. A reduction of 11 crew members will result in an annual savings of $1,137,400.

The roster for Line 1 is 359 operators for a 7 days a week operation. OPTO will reduce this number by 50% to 180 operators. An additional 10 crew members will be required for stepbacks at Vaughan and Finch Stations for the 7 day week. Under OPTO the roster will be 190 operators with a reduction of 169 crew members. This will result in an annual cost savings for Line 1 of $17,474,600.

The total annual labour savings for both Lines 4 and 1 would equal $18,612,000.

Return on Investment (ROI)

The return on investment or ROI calculation is based on the total cost for the Train Door Monitoring project of $62.6 million.
The ROI is calculated as the gain on investment less cost of investment divided by the cost of investment; or by the following formula:

\[
ROI = \frac{\text{gain on investment} - \text{cost of investment}}{\text{cost of investment}}
\]

Applying the figures from Lines 4 and 1 above to the ROI formula from years 1 to 4 yields the following:

ROI (year 1) = \( \frac{18.6 - 62.6}{62.6} = -70\% \)

ROI (year 2) = \( \frac{37.2 - 62.6}{62.6} = -41\% \)

ROI (year 3) = \( \frac{55.8 - 62.6}{62.6} = -11\% \)

ROI (year 4) = \( \frac{74.4 - 62.6}{62.6} = 19\% \)

**Conclusions**

- A positive return on investment is achieved in year 4.
- The fleet modifications for the TDM and CSDE will be launched in 2016. It will take 3.5 years to complete.
- From the above ROI calculations, when OPTO is rolled out on Line 1 around 2019 after ATC project, it is possible to achieve positive returns sooner than 4 years. ATC is targeting to finish installations on Line 1 in 2019.
- In addition to the opportunities of redeployment to the station duties, it is expected that any surplus workforces could be absorbed by the new extensions of Eglinton Crosstown and Finch West Light Rail Transit.

As Line 4 is first to be migrated to OPTO, the operator roster is small and any surplus operators can be easily redeployed within Subway. The second deployment of OPTO on Line 1 has a much larger operator roster. To encourage union support, TTC would be prepared to manage the train crew reduction from two to one person through attrition (retirements and resignations), transfers and promotions within TTC and future service improvements.

The Chief Financial & Administration Officer has reviewed this report and agrees with the financial impact information.

**Accessibility Issues**

Toronto Rocket trains are fully accessible and active consultations with the Advisory Committee on Accessible Transit (ACAT) will be continued.