

**TORONTO TRANSIT COMMISSION
REPORT NO.**

MEETING DATE: January 31, 2007

SUBJECT: Customer Input Regarding Seating Preferences

RECOMMENDATIONS

It is recommended that the Commission:

1. Approve the following changes to the forthcoming order of 220 Orion VII buses, based on input gained from customer research:

- replace eight forward-facing seats with six inward-facing (perimeter) seats in the rear section of the bus;
- provide padded seats throughout the bus;
- install additional stanchions and stop-request buttons in the rear section of the bus;

2. Note that:

- the changes recommended in this report are those which staff believe can be incorporated into the design of the forthcoming order of Orion VII buses, but do not necessarily represent the best or final design for this bus;
- the TTC's Vehicle Design staff will continue to do further work and research aimed at making the Orion VII bus more customer-friendly, including additional public consultation, pertaining to seating configuration, styles of seats, design and height of hand-holds, window operation, interior colours and materials, destination signage, and other design features, for possible incorporation into the retrofitting of the existing fleet of Orion VII buses, and into future bus orders and other vehicles such as streetcars;

3. Forward this report to Transit Windsor, thanking them for loaning buses to the TTC for research, and for the considerable time and effort they put into making the necessary arrangements; and

4. Forward this report to the Canadian Urban Transit Association, the City of Toronto, and the Greater Toronto Transportation Authority.

FUNDING

The recommended changes to the forthcoming order of 220 Orion VII buses are not expected to increase the cost of that contract in a substantive way. The change in cost is the subject of negotiations between the TTC and Orion Bus Industries, but is expected to be at a level which can be accommodated with only minor changes to the budgeted costs.

The revised seating layout will reduce the capacity of these 220 Orion VII buses which, in turn, will result in increased operating costs for these particular buses of approximately \$700,000 per year. In addition, the provision of padded seats may result in increases in seat maintenance costs. No budgetary provisions for the impact of the recommended changes have been included in either of the proposed 2007 TTC Operating Budget or the proposed 2007-2011 TTC Capital Program.

These costs will be monitored and, if significant, will be reported in future to the Commission.

BACKGROUND

The TTC began taking delivery of Orion VII buses in 2002, and plan to eventually own over 1100 of them. One hundred are to be delivered between February and May of 2007. The next order, consisting of 220 buses, is scheduled for delivery starting in the fall of 2007.

At its September 20, 2006 meeting, the Commission directed that staff undertake public consultation on alternative seating layouts and designs for the rear section of the Orion VII buses to determine if improvements can be made to the design for current and future bus orders, as well as to identify changes which would improve customer satisfaction with the TTC's current fleet of Orion VII buses. Specifically, the Commission approved:

- 1. That staff present options for improving the comfort and usability of the seating arrangement of the upper rear deck of all future low floor Orion buses that the TTC purchases.*
- 2. That our passengers be given the opportunity to suggest alternate seating arrangements and staff design a public input process that would bring quantitative data forward in a report to the Commission on the best possible design.*
- 3. That staff explore with the manufacturer an opportunity to change the seats and/or seating configuration for buses that have been ordered but not yet delivered and report to the Commission.*
- 4. Once an improved seating arrangement has been identified, that staff report on opportunities and costs to retrofit the new buses that are presently in service.*
- 5. That staff also take into consideration the comments provided by the deputant concerning this matter.*

At this point in time, it is too late to change the design of the interior of the 100 Orion VII buses which are scheduled for delivery in the spring of 2007. However, it is possible to change the design of the interior of the forthcoming order of 220 Orion VII buses.

This report responds to the directives from the Commission, and recommends changes to the design of the interior of the forthcoming order of 220 Orion VII buses.

DISCUSSION

The transit industry has always struggled over the challenge to strike the best balance between vehicle interiors which are comfortable, attractive, and inviting for customers, and which also make most-efficient use of the space within the vehicle in order to maximize productivity and efficiency. The TTC is no exception to this problem. The recent Commission deliberations over seating configurations for the next

generation of TTC subway cars partly illustrates the conflict between these competing objectives. The TTC's vehicle loading standards, which are part of the Commission-approved service standards, were the result of extensive research and analysis to determine what is the appropriate number of passengers which should be accommodated on different types of transit vehicles in order to ensure that passengers have a reasonable degree of comfort and manoeuvrability while, at the same time, making most efficient use of the interior space.

At least as far back as the mid-1980s, Commissioners and staff have expressed concern about customers' reluctance to move to, and use the rear sections of buses and streetcars. In the 1980s, on-board surveys were undertaken in order to better understand this pattern of behaviour, and various initiatives have been tried over the years to encourage people to use the rear section of buses and streetcars. Decals within the vehicles, marketing campaigns, and driver announcements have all been tried as a means of encouraging customers to use the back of buses and streetcars. These have all been met with limited success.

The seating layout which is currently found in the TTC's Orion VII buses, was designed to provide as many forward-facing seats as possible in the rear section of the bus. This layout was based on research over the years which showed two consistent patterns:

1. Customers generally do not move to the back of buses and streetcars, resulting in that part of the vehicle being poorly used. This problem has been exacerbated by low-floor buses because, with these buses, customers now have two added deterrents to moving back -- the steps which must be climbed to get to the rear section, as well as the solid panels which separate the front and rear sections of the bus, creating something of a "walled-off" effect; and
2. Customers prefer to be seated when they are travelling, as opposed to standing.

Staff believed that putting more front-facing seats -- the kind which customers generally prefer -- in the rear section of the bus would be an incentive for passengers to move back and to make more effective use of the rear section of the bus. Buses which can attract more people to the back will typically carry more passengers and, therefore, reduce operating costs.

Since the introduction of the Orion VII buses, TTC staff and Commissioners have received feedback from customers regarding the level of comfort and manoeuvrability in the rear section of these buses. This feedback culminated in the Commission's directives of September 20, 2006, to consult with customers in order to find an alternative seating design for the rear section of this bus.

Public Consultation and Input

TTC staff have undertaken five different exercises in order to consult with the public, get input from customers, and better understand customers' behaviour regarding use of the rear section of Orion VII buses. The first two initiatives were in response to a Commission directive, at the March 22, 2006 meeting, that "...the TTC undertake a consumer opinion survey of our customers to determine changes that customers would like implemented to make the new low-floor buses more customer friendly". These consultation initiatives, designed to obtain feedback regarding the design features of the Orion VII buses, were done during the period April 25 to May 6, 2006:

1. Telephone interview surveys of 400 people who had been confirmed to have ridden on a TTC bus within the past seven days; and
2. Direct on-board surveys of 880 customers riding on Orion VII buses.

In response to the September 20, 2006 Commission directive for public consultation, TTC staff undertook these three additional customer consultation exercises, during October and November, 2006:

3. Three focus group-based in-vehicle tests of different seating configurations and seat types;
4. On-board counts of actual usage or occupancy rates pertaining specifically to the seats and standing area in the rear section of the Orion VII buses; and
5. Consultation with representatives of the Advisory Committee on Accessible Transportation (ACAT) to obtain perspectives on this matter from the disability community.

The results of each of these customer research initiatives is summarized here. Details regarding each are contained in the appendices to this report, which are on file in, and available from, the General Secretary's office.

Telephone Interview Surveys

In April-May 2006, 400 people, confirmed to have ridden recently on TTC buses, were surveyed by telephone. The purpose of this survey was to determine:

- What are the most important aspects which determine good quality transit service?
- How important is the interior design of a vehicle in determining good quality transit service?
- What are the most important interior design features which contribute to good quality transit service?

The main findings from this telephone survey were:

- From the customers' perspective, the most important factors, by far, which contribute to good quality transit service are the level (frequency) of service, and the reliability of that service (these findings are highly consistent with the research underlying the recommendations of the Ridership Growth Strategy);
- While far less important than reliable service, a majority (71%) of respondents rated interior design and layout of the bus as somewhat-to-very important in determining the quality of transit service;
- Among interior design features considered important in contributing to quality transit service, the respondents stated that the provision of more hand-holds/stanchions, easier-to-reach hand-holds, and the provision of more stop-request buttons were most important;
- A majority of respondents stated that it was important that vehicles be designed to accommodate wheelchairs and other mobility devices.

The respondents in this telephone survey did not make particular note of the seating layout or configuration of the rear section of the Orion VII or New Flyer low-floor buses.

Details regarding the results of the telephone interview surveys are contained in Appendix A of this report, which is on file in, and available from, the General Secretary's office.

On-Board Direct Interviews

In April-May 2006, direct interviews were done with 880 customers while they were riding on Orion VII low-floor buses. The purpose of these surveys was to identify specific features about this bus which customers liked or disliked, and to determine customer behaviour with respect to their decisions to use or not use the rear section of these buses. The main findings from these on-board surveys were:

- The respondents stated that there was no aspect or part of the Orion VII bus which they particularly disliked or which stood out as being problematic;
- When asked specifically about the rear section of the bus and what features they disliked, respondents identified the aisle width (too narrow to let people pass), and the need to climb steps in order to access the rear section;
- When the respondents were asked if they use, or would use, the seating in the rear section of the bus, 74% said they do/would;
- When respondents, who said they do not/would not use the seats at the rear section, were asked why not, the main reason given was that they find it too much trouble to climb the steps to access the rear section.

This on-board survey of 880 customers riding Orion VII buses suggests that the main deterrent to using the rear section of this bus is the narrow aisle width in that section, and the need to climb steps to get to the section. The seating configuration and/or comfort of these seats were not identified as a significant factor in the respondents' use of the bus.

Details regarding the results of this on-board survey are contained in Appendix B of this report, which is on file in, and available from, the General Secretary's office.

Focus Group Research Regarding Rear Section of the Orion VII Bus

The purpose of this research was to allow customers to personally test, and provide feedback regarding two possible changes to the design of the rear section of the Orion VII buses which could potentially address the issues of narrow aisle width, inadequate knee room, and difficulty in manoeuvring into and out of the seats. Specifically, this research would allow customers to assess whether the use of thinner seats and/or a different seating configuration would improve customer comfort in the rear section of these buses. In order to allow actual on-board testing of these different features, the TTC borrowed, with significant effort and assistance from Transit Windsor, two Orion VII buses which were equipped with these features. This allowed direct comparison and testing of three different designs for the rear section of the Orion VII bus:

1. A (TTC) Orion VII bus whose rear section is equipped with standard TTC seats and a configuration where all seats face forward (see Exhibit 1);
2. A (Transit Windsor) Orion VII bus whose rear section is equipped with thinner, higher-backed, contoured seats and a configuration where all seats face forward (see Exhibit 1);
3. A (Transit Windsor) Orion VII bus, whose rear section is equipped with thinner, higher-backed, contoured seats and a configuration consisting of a combination of forward-facing seats and inward-facing (perimeter) seats (see Exhibit 2).

The two different types of seat styles tested are shown in Exhibit 3.

**Exhibit 1:
Existing All-Forward Facing
Layout in Rear**

**Exhibit 2:
Alternative 8-Seat Inward
Facing Layout in Rear**

Exhibit 3: Seating Styles Examined by Focus Groups

Style A: Existing TTC Seat Style

Style B: Alternative Seat Style

Three focus groups, each of twenty-two or more participants (enough to fill all seats in the rear section of the Orion VII bus, and have some standees) were recruited. On November 4, 2006, each of the groups of participants were invited, in turn, to test the three different-designed Orion VII buses which had been brought to the bus-platform level of Spadina Subway Station. The participants of each group were asked to board each of the buses, try each of the different seat types and configurations and, while on-board, were taken for rides up and down Spadina Avenue in order to test the different interior designs in real-life in-service operating conditions. The participants were asked to complete surveys regarding each of the buses, and to participate in discussion groups lead by professional market research personnel.

Here are the main findings from the focus group research, grouped together by topic:

Seating Configuration

- Respondents do not like the TTC's existing forward-facing seat configuration because it results in limited knee room, notably for customers seated in the third and fourth rows of seats;
- Participants do not like the TTC's existing forward-facing seating configuration because it results in a narrow aisle which becomes impassable if even one person is standing in the aisle;
- Participants stated that the main reason they do not prefer to use the rear section of the existing TTC Orion VII buses is their concern that the narrow aisle could result in them not being able to easily get to the door when they arrive at their stop;
- 85% of participants said that they would prefer to have more aisle space in the rear section of the bus, even if this meant having fewer seats available;
- Approximately 70% of participants stated a preference for the seating configuration which includes inward-facing (perimeter) seating because they perceive this configuration to provide more aisle width;
- Participants stated that the seating configuration which includes inward-facing (perimeter) seating would make it easier to get to and from the seats in the rear section of the bus;
- Participants stated that they did not like the unstable side-to-side swaying motion which results from inward-facing (perimeter) seating but, nonetheless, this discomfort was rated less important than improved aisle widths.

Seat Style

- Participants expressed a strong preference for a longer seat bottom, such as is found on the seats which the TTC currently uses in buses;

- Participants expressed a strong preference for the “support and comfort” of the higher–and contoured–back featured on the alternative thinner seat style which was tested;
- Participants noted that the TTC’s existing seat style, which has a lower back, does not block seated customers’ views within the bus as much;
- Participants were evenly split in their overall preference between the TTC’s existing seat style and the thinner, higher-back, more-contoured alternative seat style which was tested;
- Participants expressed a strong preference that seating in buses be padded for enhanced comfort while travelling.

Other Design Features

- Participants stated that they wanted more vertical and horizontal stanchions within the rear section of the bus;
- Participants expressed a strong preference for higher, more-rounded, and easier-to-grip hand-holds, as were found on the alternative seat style tested;
- Participants stated they would like more stanchion-mounted stop-request buttons provided within the rear section of the bus.

Details regarding the focus group research are contained in Appendix C of this report, which is on file in, and available from, the General Secretary’s office.

Revenue-Service Observation of Passenger Use of Rear Section of Orion VII Buses

In October 2006, TTC field staff were assigned the task of observing and recording the rate of seat use and occupancy in the rear section of Orion VII buses, under peak loading conditions when distribution of passengers throughout the bus and use of available seats are most important.

It was found that, when passenger loading becomes heavy on the Orion VII buses, there is virtually full use of the seats and standing area in the rear section of the bus. With this pattern of use in the rear of this bus, the current design and configuration of the rear section of the TTC’s current Orion VII buses is achieving very effective use of the rear section of this bus, which means the current design and configuration is a very productive and efficient one. Despite the long-standing history of people refusing to move to the back of buses, and despite the expressed displeasure with the current narrow aisle width and limited knee room in the current Orion VII buses, the configuration of these buses is achieving exactly what it was designed to do and what other previous TTC buses have not managed to do – attract people to use the rear section of the bus and make efficient use of that space.

Input from Advisory Committee on Accessible Transportation (ACAT)

Two representatives from the Advisory Committee on Accessible Transportation (ACAT) also examined and evaluated the three different buses which were used for the focus group testing. It was noted that the main accessibility features of the low-floor buses are found in the front section of these buses, and that the rear section of the buses would be of less interest to people with disabilities. Nonetheless, after reviewing the three different designs in the rear section of the three

test buses, the ACAT representatives concluded that the preferred seating arrangement for this bus was the one which had a combination of front-facing and inward-facing (perimeter) seating. The benefits identified were better legroom for seated customers, more room for standing customers, and better ability to move within the rear section. The ACAT representatives also noted that the higher, more-rounded, easier-to-grip hand-holds found on the alternative test seats were a better ergonomic design and, therefore, better suited for customers.

Summary of Research Findings

The priorities and feedback from riders pertaining to bus design and seating configuration varied widely, depending on the context in which the input was collected.

The 400 TTC customers who were interviewed by telephone, did not express concern about the seating layout or configuration of the Orion VII buses but, rather, highlighted the importance of more and better-designed hand-holds, more stanchions, and more stop-request buttons. Similarly, the 880 TTC customers who were interviewed on board Orion VII buses in revenue service did not identify seating configuration or comfort of seats as being problematic or a significant concern. When asked to comment specifically on the rear section of the bus, these customers noted their dislike for the steps which lead to the rear section and the narrowness of the aisle in that section.

Participants in the focus group research, who examined the rear section of the bus with greater scrutiny, expressed displeasure with the limited knee-and-leg room, notably in two particular rows of seats, and with the narrow aisle which becomes impassable if there are standees. These participants stated a preference for a seating configuration which includes inward-facing (perimeter) seating in order to obtain more aisle width, even if this meant having fewer seats in the bus. These participants expressed a strong desire for more-comfortable, padded seats. They also expressed a strong preference for more and better-designed hand-holds, more stanchions, and more stanchion-mounted stop-request buttons within the rear section of the bus.

Observations of real revenue-service operation of the TTC's current Orion VII buses showed that customers consistently use the rear-section seating of these buses under heavy-loading situations. This results in a productivity and efficient use of the rear section of these buses which has not previously been achieved in other bus designs at the TTC, including the all-perimeter seating, wide-aisle design of older high-floor buses. Therefore, despite the customer expressions of displeasure over the design of the rear section of the Orion VII buses, customers are using this section of these buses more than they ever used the rear sections of any previous TTC bus design.

Recommended Changes to the Design of the Orion VII Bus

Despite the variety of the research findings, and despite the high level of customer use of the rear section of the Orion VII buses, the customer comments conveyed by the Commission and the research findings from the more-rigorous focus group review of the bus suggests that it would be appropriate to implement changes to the design of the TTC's Orion VII bus. In particular, it is recommended that the forthcoming order of 220 Orion VII buses incorporate these changes:

- replace eight forward-facing seats with six inward-facing (perimeter) seats in the rear section of the bus (see Exhibit 4). This mixed forward-facing/inward-facing seating configuration is the same as is used by MTA New York City Transit for their Orion VII buses and, therefore, is readily available from Orion Bus Industries;

**Exhibit 4:
Recommended 6-Seat
Inward Facing Layout in**

- provide padded seats throughout the bus;
- install additional stanchions and stop-request buttons in the rear section of the bus;

Customer Service Implications of Recommended Changes

Knee Room

The recommended mixed forward-facing/inward-facing (perimeter) seating configuration will address the specific knee room problems identified with the current Orion VII buses. Customers who now experience the most-constrained knee-room and least-conveniently- accessed seats because of the immovable backs of the seats in front of them will now, instead, face inward toward the open aisle. Testing of the (Transit Windsor) Orion VII bus with the mixed-seating configuration identified no deficiencies in knee room.

Aisle Widths

Despite focus group participants' perception that the inward-facing seating configuration creates a wider aisle, this configuration actually results in less clear aisle space than is now provided by the forward-facing seating configuration in the TTC's current Orion VII buses. This is the result of two factors:

- The location of the rear wheel-wells in the Orion VII bus requires that inward-facing seating be located away from the outside wall, resulting in a significant amount of unusable or wasted space between the inward-facing seats and the wall of the bus (see Exhibit 5); and

**Exhibit 5:
Gap Behind Inward-Facing Seats**

Gap between seats and wall ↘

- Of the aisle space which does exist between the inward-facing seats, a significant portion of it will be occupied by the legs and feet of inward-facing seated passengers.

Although this configuration will result in a net loss of aisle space compared to the current seating configuration, it should still be easier for customers to move up and down the aisle because passengers can step over the feet of seated passengers and because seated passengers can tuck in their feet to allow other passengers to move in the aisle.

The recommended mixed-seating configuration still contains two rows of forward-facing seats which will limit aisle width, but this constraint will be shorter than in the current all-forward configuration, so it will be easier for customers to get through.

Capacity of the Bus

The recommended change in seating configuration will result in a net reduction in capacity of the Orion VII bus for both peak and off-peak service. The mixed-seating configuration requires that eight forward-facing seats be replaced by six inward-facing seats, for a net loss of two seats. However, because there is no increase in the room available for standing customers, the reduction in seating capacity is not replaced by standing capacity. The result is that both peak and off-peak loading standards will be reduced by two passengers. Peak-period loading standards are based on all seats being occupied plus a percentage of standing room being occupied, while off-peak loading standards are based on all seats being occupied.

Seat Style

The provision of more-comfortable padded seats in TTC buses will result in customers being more satisfied with the quality of ride they receive.

Cost Implications of Recommended Changes

No substantive change in cost is expected from modifying the design of the forthcoming order of 220 Orion VII buses to include the modified seating configuration, padded seats, and additional stanchions and stop-request buttons. The final cost is the subject of negotiations between the TTC and Orion Bus Industries, but it is expected that it will be possible to accommodate the change in cost without any significant changes to the budgeted expenses for this contract.

The reduction in peak and off-peak loading standards which will result from the recommended mixed-seating configuration means that fewer customers can be carried per bus, resulting in lost productivity and efficiency. The operation of 220 buses whose capacity is two passengers less during all operating periods will require that the Operator workforce be increased by six, and will result in an overall increase in annual operating costs of approximately \$700,000.

The provision of padded seats in these buses will result in increases in seat maintenance costs. These will be monitored and, if significant, will be reported in future to the Commission.

Follow-Up Work Required

The recommended changes in seating configuration and seat style are those which were identified through the customer research to date and which staff believe can be incorporated into the

forthcoming order of 220 Orion VII buses. However, these changes do not address all of the customer concerns raised in the course of the research regarding factors such as the steps which must be climbed to access the rear section of the bus, adequate aisle widths, and more ergonomic designs for hand-holds.

Additionally, the recommended change to seating configuration cannot be retrofitted into the TTC's existing fleet of Orion VII buses because these buses have different wheel-well housings which cannot accommodate this inward-facing (perimeter) seating. Further research will be required with respect to possible changes to the seating configuration and seat styles feasible and appropriate for these buses. TTC Vehicle Design staff will continue to study possible improvements and to consult the public on these matters and other matters raised by the public in the research exercises, such as door-opening technologies, window operation and size, and interior materials and colours.

JUSTIFICATION

Customers have indicated displeasure with the current design of the rear section of the TTC's Orion VII buses. The recommended changes to the seating configuration will reduce the seating discomfort experienced by customers, while the addition of features such as padded seats, more stanchions, and more stop-request buttons will improve the quality of travel experienced by customers. Providing customers with an improved level of comfort is in the TTC's long-term interests of maintaining and increasing ridership.

January 22, 2007
11-31-45/80

Appendices A – C are on file in, and are available from, the TTC General Secretary's office.