

**For discussion on  
25 July 2018**

**Legislative Council Panel on Transport  
Enhancement of Safety of Franchised Buses**

**Purpose**

This paper briefs Members on the recommended measures to further enhance safety of franchised buses (“FBs”).

**Background**

2. Following a fatal traffic accident involving a franchised bus of the Kowloon Motor Bus Company (1933) Limited (“KMB”) at Tai Po Road on 10 February 2018, the Transport Department (“TD”) set up in mid-March 2018 a Working Group on the Enhancement of Safety of Franchised Buses (“WG”), which comprises members from all FB operators<sup>1</sup> and the major bus manufacturers<sup>2</sup>, to consider and study possible measures to further enhance bus safety. The scope of work of the Working Group covers the following major areas:-

- (a) to explore the technical feasibility, applicability and cost-effectiveness of, and any other issues relating to the installation of in-vehicle safety devices/technologies and seatbelts on all seats of FBs; and
- (b) to review the training arrangements adopted by the FB operators.

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<sup>1</sup> The five FB operators in Hong Kong are –

- (a) KMB,
- (b) The Long Win Bus Co. Ltd. (“LW”),
- (c) Citybus Limited (“CTB”),
- (d) New World First Bus Services Limited (“NWFB”), and
- (e) New Lantao Bus Co., (1973) Ltd (“NLB”).

<sup>2</sup> Three major bus manufacturers, which currently supply all the double-deck buses to the five FB operators, viz. Alexander Dennis Limited, Volvo Bus, and Regal-MAN, have been invited to join the technical meetings under the WG.

3. So far, the WG has held three meetings since March 2018; the Technical Group under the WG has also met five times. The findings and recommendations of the WG are set out in the ensuing paragraphs.

### **In-vehicle safety devices/technologies**

#### *Proposed installation of in-vehicle safety devices*

4. With the relevant bus manufacturers' confirmation on the technical feasibility, all FB operators have committed that all **new double-deck buses** procured from July 2018 onwards will be incorporated with the following two in-vehicle safety devices :-

- (a) **Electronic Stability Control (“ESC”)** - The ESC is an electronic control program for improving the stability of a vehicle by detecting and reducing the loss of traction, e.g. skidding. The ESC also provides roll stability control which can reduce the risk of a vehicle to rollover in extreme cornering or evasive manoeuvres. In mitigating the loss of control when a vehicle is cornering, the ESC would detect loss of steering control (i.e. under-steering or over-steering when the vehicle is cornering) and will automatically activate the electronic braking system of the vehicle to assist steering of the vehicle to keep the vehicle running on its intended track. Braking of the vehicle may automatically be applied to the vehicle wheels individually. ESC may also reduce the engine power until the control of the cornering vehicle is regained.
  
- (b) **Retarders for capping the maximum speed of the speed limiters on downhill (“speed limiting retarder”)** - All FBs are now equipped with speed limiters to limit the maximum speed of a bus at 70 km/hour. The current speed limiter performs its function by means of cutting off fuel supply to the engine when the speed is over 70 km/hour, but it cannot control over-speeding downhill which is steep enough for the vehicle to be in free roll by the force of gravity. It is technically feasible to enhance the speed limiter with a “retarder” to slow down a bus when the speed is over 70 km/hour under the downhill situation.

5. As for **existing buses**, the bus manufacturers have confirmed that it should be technically feasible to provide ESC and speed limiting retarder on some buses of the newer models<sup>3</sup>, subject to the development of the retrofitting scheme and tests. Out of the total fleet of about 6 000 existing FBs, about 3 300 double-deck buses may be feasible for retrofitting. The WG recommends that the FB operators and the bus manufacturers start the development of these two add-on devices for existing buses, with a working target to commence the tests of the devices and trials of the retrofitting work in about 12 to 18 months (i.e. in the second half of 2019). Subject to proven technical feasibility and financial viability, all FB operators would then develop detailed plans for retrofitting.

#### *Trials of new safety technology*

6. In order to enable the FB operators to step up their management and control of their bus fleet, and reduce the potential risks arising from human errors or effect of unsafe driving behaviour, the WG considered that new safety technology which can assist the FB operators in monitoring and controlling bus safety should be actively explored. Generally, the FB operators have committed to further exploring sources of supply of various latest safety devices/technology and launch **trials** with a view to establishing the technical feasibility and cost-effectiveness of their application in FBs :-

- (a) **Bus Monitoring and Control System (“BMCS”)** - In view of the latest technological development in bus fleet management system and black box with functions on real time fleet supervision, bus speed recording, Global Positioning System (“GPS”) location recording, etc., the WG considered that it should be a medium-term goal for FB operators to develop a comprehensive BMCS with positioning function, operational information monitoring function, and variable speed limiting function with geo-fencing technology. In brief, by making use of GPS or other positioning technologies, the system will match the legal speed limit at the actual bus location. This real time speed limit information can then be used to control the enhanced speed limiter (i.e. speed limiter with 2 speed settings). In other words, the bus speed could be controlled or limited within the applicable speed

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<sup>3</sup> These include Euro V buses of ADL Enviro 500 manufactured from 2013, Volvo B9TL and MAN A95 buses and all Euro VI buses.

limits (i.e. 50km/hour or 70km/hour depending on the road section). The system will also enable the FB operators to monitor their bus fleet more closely and to take appropriate management action against over speeding and other unsafe or improper driving behavior such as heavy braking or inappropriate speed during cornering or downhill. To this end, FB operators have agreed to proceed with developing the system and conducting trials in two phases, namely:-

- (i) Phase 1 : A BMCS with positioning function, operational information (such as vehicle speed, brake status, deceleration, etc.) monitoring function and geo-fencing technology for fleet management will be put on trial to achieve detection of speeding and provide real-time alert to the bus captains; and
  - (ii) Phase 2: Subject to the successful development of the Phase 1 Trial, the BMCS so developed will be incorporated with additional application of enhanced speed limiter being developed by bus manufacturers so as to limit the bus speed in accordance with the corresponding speed limit of various road sections.
- (b) **Collision alert and lane keeping devices** - The collision alert system is an add-on device which will give an alert to the bus captain in the event of a possible crash. The lane keeping device is also an add-on device to alert the bus driver when the bus starts moving away from the lane other than proper steering. Both devices are available in the market. Thus, trial of using the devices in FB to assess their applicability and effectiveness is recommended.
- (c) **Driver monitoring device** – Such device monitors the bus captain’s behavior on-board and alerts him / her if it detects a lack of attention or drowsiness. When the system detects potential unsafe behaviours such as “looking aside”, ‘dozing”, “drowsiness” or “bad posture”, the system will give visual warning and voice alert. Such device is available in the market, and trial of using it in FB to assess its applicability and effectiveness is recommended.

7. Details of the above-mentioned proposed trials and the target timeframe for the trials are set out in **Annex A**

8. To evaluate the applicability and effectiveness of using geo-fencing technology to control vehicle speed, which is one of the vital parts of the BMCS mentioned in paragraph 6(a) above, the TD plans to engage a service provider to carry out an independent trial on vehicles. A trial of the technology will be conducted first on private cars. Subject to the satisfactory result of the technological trial on private cars, the hardware system for controlling the speed limiter of buses will be developed. The independent trial is at preliminary planning stage, and further details of the trial will be developed.

9. The WG has also explored the proposal for installing a speed display unit (“SDU”) in bus compartments to provide visual display of the current speed of FB for information of the passengers on-board. Although such device is technically not difficult to install, the FB operators cautioned the WG that it may give rise to possible conflicts between the bus captains and the passengers on board, and that bus captains may have concerns on the proposal. The WG considers that at this juncture, the priority should be to ask the FB operators to press ahead on the development and trials of the BMCS, which is a more effective and comprehensive solution for monitoring the operation and driving behaviour of bus captains, instead of pressing for the installation of the SDU and relying on passengers to monitor the vehicle speed.

### **Installation of Seat Belts on Passenger Seats**

#### *Technical feasibility*

10. At present, all the exposed seats<sup>4</sup> on FBs are installed with seat belts to prevent passengers from falling out from the seats.

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<sup>4</sup> Exposed seats refer to forward facing seats in a FB which are not immediately behind another forward-facing seats or an internal partition/panel. Usually, there are about one and 14 exposed seats on a single-decker and a double-decker respectively. Unlike other non-exposed seats, which there are some forms of “restraints” (either a seat back or a partition) that can help restraint the passengers from falling out of the seats during accidents, exposed seats do not have such restraints. Installation and use of seat belts on these exposed seats provide some protection in restraining the passengers from falling out of the seats.

11. As confirmed with the bus manufacturers, it is technically feasible to supply all new buses with seat belts for all passenger seats conforming to relevant international standards. In this regard, all FB operators have agreed that all passenger seats of **all new buses** ordered from **July 2018 onwards** will be installed with seat belts.

12. Regarding retrofitting of seat belts on all passenger seats of existing buses, the bus manufacturers have advised that the floor structure (especially on the lower deck) of the existing buses is not designed for seat belt installation and that the bus body's frame cannot absorb the relevant impact force. Hence, reinforcement of the existing floor structure, body's frame and replacement of all the existing passenger seats by those with seat belts fitted is required. In practice, retrofitting seat belts on passenger seats, in particular those on the lower-deck, will involve substantial modification and reinforcement of the bus chassis, including reinforcement of the structure of the FB, addition of support mountings, replacement of all seats by those with seat belts, as well as passing the pull tests of the seat belts and seats to confirm their compliance with the international standards, etc. Considering the above, the bus manufacturers have advised that it is technically impracticable, if not infeasible, to retrofit seat belts on all passenger seats of both upper and lower decks.

13. However, it should be more feasible to retrofit seat belts on **all passenger seats of the upper deck only in some vehicle models** of the existing double-deck fleet. If all passenger seats on the upper deck are retrofitted with seat belts, it is expected that the weight of the bus will be increased by 300 to 400kg and consequently the passenger carrying capacity may need to be reduced by 7 to 8 passengers.

14. In this regard, the WG considers that time and manpower resources are critical. The bus manufacturers do not have the required labour and workshop facilities in Hong Kong to conduct the retrofit work. The FB operators would need to spare their skilled workers and workshop facilities for the work; at the same time, the regular vehicle maintenance work should not be affected. The FB operators would also need to arrange the retrofit work carefully so that they would have enough FBs for the provision of service and as backup vehicles at any point of time. Some bus operators have expressed concerns that the

retrofitting of seat belts would not only incur significant financial implication<sup>5</sup>, but also considerable time and manpower resources, not to mention the need to re-deploy or procure additional buses to maintain the existing bus service level during the whole process.

### *Overseas' experience/practices*

15. The WG has reviewed the prevailing overseas practices or requirements on the installation and wearing of seat belts on buses. Currently, for inter-cities or cross-boundary routes, some overseas jurisdictions (e.g. United States, United Kingdom and Netherlands) have mandated the provision of seat belts for all passenger seats, while others (e.g. United Kingdom, Netherlands, and Australia (Victoria)) have imposed mandatory requirement of wearing seat belts. Nevertheless, for buses serving urban routes buses or buses allowed to carry standing passengers, none of the overseas jurisdictions that the WG has reviewed thus far have statutory requirements for the provision of seat belts on passenger seats. According to the transport authorities of those jurisdictions, the urban buses are typically used for short journeys, in terms of both time and distance, and undertaken at moderate speeds on urban routes. Thus, no seat belt requirement at passenger seats on these urban buses has been imposed. A summary of the findings is at the **Annex B**.

### *Recommendation and proposed way forward*

16. Having regard to the points mentioned in paragraphs 10 to 15 above, the WG has arrived at the following recommendations with a view to giving extra protection to seated passengers :-

- (a) seat belts should be provided for **all seats** in future procurement of **new buses**; and
- (b) subject to further assessment on the technical, operational and financial feasibility, consideration may be given to retrofitting all seats in the **upper deck with seat belts on buses deployed for specific bus routes**,

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<sup>5</sup> With the absence of detailed study on the technical details for retrofitting seat belts on all seats in the upper deck, a rough estimate on the costs of retrofitting a bus is about HK\$200,000 (excluding manpower and overhead costs).

i.e. long-haul routes which are operated via expressways<sup>6</sup> with relatively fewer bus stops<sup>7</sup>.

17. The TD will require the FB operators to explore in more details in conjunction with the bus manufacturers to ascertain the technical feasibility of retrofitting seat belts on the upper deck of different bus models, the operational and capacity considerations in developing the timetable for the retrofitting works and how such considerations may be addressed, as well as the financial implications, in order to decide whether and, if so, how all passenger seats on the upper deck of existing double deck buses deployed for long-haul routes mentioned in paragraph 16(b) can be retrofitted with seat belts. In the meantime, the TD will work with the FB operators to promote the use of seat belts if they are available (at exposed seats or on new buses).

### **Training for Franchised Bus Captains**

18. The WG has also reviewed the existing training arrangements provided by the FB operators to bus captains. The WG has agreed that the TD should promulgate a practice note on training framework for FB captains. The practice note seeks to align the training arrangements of different FB operators and lay down a set of industry-wide standard practices in respect of the FB captains' training framework, including the basic requirements on modules, as well as duration and weighting, so as to provide a common basis for internal monitoring and audit within individual FB operators.

19. Under the practice note, the structure of the training arrangement for bus captains, irrespective of whether they are full-time or part-time bus captains, should at least include :-

(a) **Regular Training**

(i) *induction course for new recruits* would include both classroom training and behind-the-wheel road training in order to equip them

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<sup>6</sup> Examples are the Island Eastern Corridor, Kwun Tong Bypass, Tolo Highway, Tuen Mun Road, the North Lantau Highway, Tsing Long Highway, etc.

<sup>7</sup> According to the FB operators, about 2 000 buses are deployed on these routes.



with the necessary information and skills and experience in bus operations before providing passenger service; and

(ii) *refresher course* once every three years to share important and current job-related information with the in-service bus captains.

(b) Special-purpose Training

(i) *new bus route training*, in the form of behind-the-wheel training, for in-service bus captains to ensure that they are familiar with the route before they are deployed on service;

(ii) *training for operating new bus type /model with new driving features*, in the form of behind-the-wheel training, for in-service bus captains to ensure that they are familiar with the operation of the new bus type/model before they are deployed to operate the new bus type/model on service; and

(iii) *remedial training* for in-service bus captains with improper driving behaviour or attitude.

20. As for the regular trainings for bus captains, the practice note has also aligned the modules, with relative weightings, to be covered. Such trainings should cover the following modules :-

<b>Modules</b>	<b>Weightings</b>
(a) Safe driving and road safety	60% - 85%
(b) Cognition of in-vehicle device/facilities	
(c) Handling of incident/emergency	15% - 40%
(d) Customer service & emotional management	
(e) Knowledge of company rules, traffic regulations, occupational health and safety	

21. To ensure that adequate and appropriate trainings are provided to the bus captains, the FB operators have agreed to and will set up an internal monitoring and audit mechanism to develop key indicators to measure the effectiveness of the training system provided to bus captains, monitor the

performance of indicators, and in the light of the findings of the monitoring effort, to review and determine appropriate actions or measures.

22. Given that different FB operators have different bus networks operating in different operating environment, it is necessary for them to tailor make individual specific training programmes to cater for their respective operational needs while following the common framework and standards as set out in the above-mentioned practice note. The FB operators are revamping their training courses and will start implementing the new arrangements in accordance with the practice note by phases starting from October 2018 onwards. The TD will review the practice note with FB operators on a regular basis, in order to strive for the best standard practices to cater for the ever-changing operating needs and public expectations on safe FB services.

### **Advice sought**

23. Members are invited to note the content of this paper.

**Transport and Housing Bureau**  
**Transport Department**  
**July 2018**

## Annex A

### **Proposed Trials on In-vehicle Safety Devices and Technologies on FBs**

<b>Proposed in-vehicle safety devices/technologies</b>	<b>Trials Recommended</b>	<b>Target Timeframe</b>
<p><b>(1) Bus monitoring &amp; control system (BMCS) –</b></p> <p>An integral system with positioning function, operational information monitoring function, variable speed limiting function with geo-fencing technology.</p> <p><u>Phase 1 Trial</u> : BMCS with positioning function, operational information (such as vehicle speed, brake status, deceleration, etc.) monitoring function and geo-fencing technology for fleet management to achieve detection of speeding and provide real-time alert to the bus captains.</p> <p><u>Phase 2 Trial</u> : BMCS to utilize the functions developed in Phase 1 together with speed limiter with 2 speed settings, being developed by bus manufacturers to achieve automatic speed limiting functions (50km/hr or 70km/hr depending on the speed limit of road section).</p>	<p>KMB/LW were conducting trial with a bus manufacturer to test the speed limiting by GPS.</p> <p>All FB operators would develop and conduct trial on the application of GPS technology for their bus fleet monitoring &amp; speed control system.</p> <p>Phase 1 trial on the application of GPS will include at least 2 routes for each FB operator.</p>	<p><u>Phase 1 trial</u> to be embarked by end 2018.</p> <p><u>Phase 2 trial</u> to be embarked within 2019, subject to the satisfactory trial result of Phase 1 and the satisfactory development of speed limiter with 2 speed setting.</p>

<b>Proposed in-vehicle safety devices/technologies</b>	<b>Trials Recommended</b>	<b>Target Timeframe</b>
<b>(2) Collision alert/ lane keeping devices</b>	<p>CTB/NWFB will install this device in 5 buses for training and assessment purposes. These buses will also be deployed on service trips.</p> <p>KMB/LW and NLB will explore similar devices from different suppliers and embark on a trial.</p>	To embark on the trial by end 2018.
<b>(3) Driver monitoring device</b>	<p>KMB/LW will embark on a trial on this device on 4 buses.</p> <p>CTB/NWFB and NLB will explore similar devices from different suppliers and embark on a trial.</p>	To embark on the trial within 2018.

**Summary of Statutory Requirements of the Fitting/Use of Seat Belts  
on Buses in Overseas Jurisdictions**

<b>Jurisdictions</b>	<b>Installation Requirement</b>	<b>Type</b>	<b>Wearing Requirement</b>
United States	All passenger seats (Except for urban buses)	3-point/ lap-belt	Not mandatory
United Kingdom	All passenger seats (Except for urban buses with standing passengers)	3-point/ lap-belt <sup>(1)</sup>	Mandatory
Netherlands	All passenger seats (Except for public transport buses)	Lap-belt	Mandatory
Australia (Victoria)	Only exposed seats (Except for buses with standing passengers)	Lap-belt	Mandatory
New Zealand	No	N/A	N/A
Canada	No	N/A	N/A
Singapore	No	N/A	N/A

**Note:**

1. Lap-belts may only fitted in forward facing non-exposed seats where an appropriate energy absorbing seat or surface is present in front.