

政府總部
運輸及房屋局
運輸科
香港花園道美利大廈



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Transport and
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Government Secretariat
Transport Branch
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5 February, 2009

Clerk to Panel on Transport
Legislative Council,
Legislative Council Building,
8 Jackson Road,
Central, Hong Kong,
(Attn: Ms Joanne MAK)
[Fax No.:2121 0420]

Dear Ms Joanne Mak,

Panel on Transport
Investigation Reports on the Bus Fire/Smoke Incidents
on 10 December 2008

Thank you for your letter of 23 January 2009. As requested by Members at the LegCo Panel on Transport meeting on 23 January 2009, the investigation reports submitted by the franchised bus companies to the Transport Department (TD) on the three bus fire/smoke incidents which occurred on 10 December 2008 are attached at Annexes 1 to 3 for Members' reference.

After the incidents, TD has conducted separate investigations to ascertain the correlation of these incidents and whether they were related to the quality of bus maintenance.

The three incidents were independent cases since no common causes were found. They were caused respectively by the failure of the alternator mounting bracket, the alternator bearing, and the rear axle gear of the

respective incident buses. TD has analyzed the record of bus fire/smoke incidents in the past three years, and found that it was the first time that failure of alternator mounting bracket and rear axle gear led to fire/smoke on all types of buses. It was also the first time that the failure of alternator bearing led to fire/smoke on the particular type of buses involved in the fire incident.

With regard to bus maintenance, the number of buses per maintenance staff of the major bus companies have generally remained consistent over the past few years. Each franchised bus has to be inspected by the bus company every month to ensure its roadworthiness. The monthly inspection checklist includes the three items related to the above incidents. The three buses involved in the incidents passed their latest monthly inspections before the respective incidents. TD has checked the monthly maintenance record of the three buses, and found no indication of abnormality in respect of the three concerned items. In order to verify the quality of the franchised bus companies' monthly inspection, TD has also carried out surprise checks on 20 franchised buses which had just passed the companies' monthly inspection and found no safety-related defects on these buses. On the basis of TD's findings, there was no evidence to suggest that the monthly inspection quality of the concerned bus companies was not up to standard nor that the incidents were related to the quality of vehicle maintenance.

To prevent similar cases of bus fire/smoke, TD and the bus companies have taken the following measures -

- i) The Kowloon Motor Bus Co. (1933) Ltd (KMB) and CityBus Limited (CTB) have completed checking of the alternator mounting bracket, the alternator bearing, and the rear axle gear on all buses of the same types in January 2009, and will complete checking similar items of other buses in the fleet by mid February 2009. So far, no abnormal symptoms were found;

- ii) KMB and CTB have consulted their bus manufacturers and parts suppliers on the three fire/smoke incidents. The manufacturers/suppliers have recommended replacing the concerned bearings with heavy duty type and to strengthen the alternator mounting bracket design. The bearings have all been replaced by the heavy duty type and the mounting bracket modification works will be completed by April 2009;
- iii) TD has increased the number of spot checks (including those immediately after monthly inspections) per working day from an average of 14 buses to 17 buses in January 2009; and
- iv) TD, the franchised bus companies and the bus manufacturers have formed a working group to explore ways to further enhance bus safety and fire prevention.

Yours sincerely,



(Miss Constance choy)
for Secretary for Transport and Housing

c.c. Commissioner for Transport (Attn: Mr Albert Yuen)



By Fax

Fax no.: 2824 4255

Our Ref.: ETSM/046/2008

17 December 2008

The Commissioner of Transport
Transport Department
41/F Immigration Tower
7 Gloucester Road
Hong Kong

Attn: Mr. Steven Tse
Engineer (Bus)

Dear Sir,

Re: Bus Fire Incident of HB5201 (Fleet No.: 735) at Stubbs Road

We refer to your fax on 10 December 2008 regarding the above bus fire incident occurred on the same day. The following are the details of the incident for your information.

Date/Time : 10 December 2008 / 07:34
Incident Location : Stubbs Road
Registration/Fleet No. : HB5201 / 735
Vehicle Type : Dennis Dragon D/D A/C
Date of 1st Reg : 05 March 1997
Last MI date : 13 November 2008
Last COR date : 28 January 2008
Chassis No. : DDA2206 / 1428
Route No. : 6
Driver :
Casualties and Injuries : None
Incident Description : At the material time, bus HB5201 was travelling along Stubbs Road towards Stanley. When it came near lamppost 15145, the Bus Captain ("BC") detected from the nearside mirror of smoke coming out from the rear of the bus. He stopped the bus immediately and evacuated all the passengers, and reported the matter to Citybus Operations Control Centre and the Police. By that time, fire flames were emitting from the engine compartment and the BC attempted to use the fire extinguisher

on board to put off the fire but in vain.

Fire Services arrived at the scene later and put out the fire.

The bus was towed away from the scene at 09:15 and back to Wong Chuk Hang Depot.

Physical Damage : The bus rear body was burnt by the fire. Some air conducts inside the bus compartment were also blackened and damaged. Most components inside the engine compartment were burnt seriously.



Cause of Incident

It is suspected that the fire originated from the engine compartment. After investigation, it is found that those electric wirings inside were damaged only as a result of the fire and there is no evidence of electric short circuit. Likewise, we cannot identify any source of fuel or oil leakage that could be made accountable for fuelling the initial ignition. All hydraulic oil is gone but again this is only a result of the burning of the oil hoses.

: The alternator of the Cummins L10 engine is first dismantled and every component is carefully examined. We note that the rotor shaft was twisted off in a ductile manner.



A steel shaft will only twist off in a ductile manner under extremely high temperature when the material is softened.

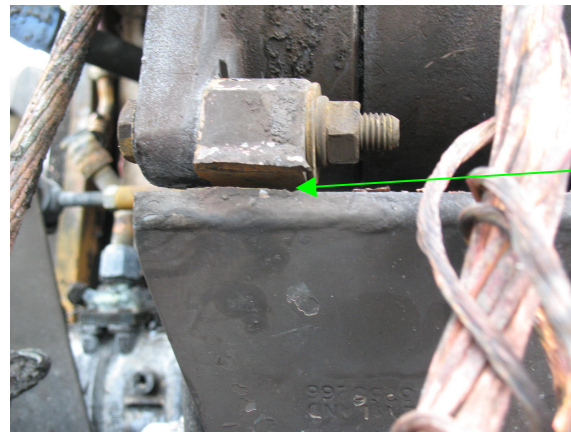


Circular surface

The other end of the twisted off shaft provides a clue of high temperature. The circular surface as indicated on the photo above is found with severe rubbing marks. For some reasons that will be elaborated below, we believe that the front-end bearing was running under uneven loading shortly before the incident. Metal particles were peeled off from the bearing cages and dropped in between the circular

surface and the bottom of the field coil. Normally, there is a clearance of a few millimetres between the two surfaces. Because of the rubbing with metal particles, intense temperature was developed.

The next question is why the front-end bearing of the alternator had been rotating with uneven loading. We examine the mounting bracket of the alternator and note that one of the two support legs is broken.



Support leg broken

It is likely that sometime before the incident, the support leg had cracked apart. The alternator was misaligned slightly and the rotor thus ran under uneven loading, leading to the eventual twisting off of the rotor shaft.

We suspect that the first fire flame is a result of tiny hot metal particles, i.e. sparks, flying out from the alternator through its cooling fan, descending on the surrounding wirings and oil hoses, and igniting them. Those sparks were produced from the severe rubbing mentioned above. This hypothesis is supported by the fact that many fan blades of the alternator's cooling fan were melted away and those remaining salvages are covered with terrible score marks.



Once the wirings and rubber hoses hit by the sparks were ignited, fire flames spread to other parts of the engine compartment, and up through the air-conditioning ducts, and so the rear bus body was severely burnt.



Preventive Measures : This incident is the first one of its kind in the maintenance history of Citybus. While we consider that this is an individual case only happening under the meeting together of a number of factors, we have decided to adopt the following preventive measures:

- All alternator brackets of Cummins L10 engines of our fleet will be checked and the exercise will complete in one week the latest.
- All cracked brackets found will be repaired or replaced as necessary.

In the long term, we opine that the alternator bracket may be prone to cracks and will seek advice from the appropriate vehicle or equipment manufacture to modify the design to stronger supporting legs.

Finally, we note that there was no monthly inspection record of the bracket being cracked or broken. We will carry out further study to investigate the circumstances.

Please do not hesitate to contact me if you have any queries and thank you for your attention.

Yours faithfully
For and on behalf of
Citybus Limited

Kenny So
Engineering Technical Support Manager

c.c.: HE, SESM, DM(WCH)



THE KOWLOON MOTOR BUS COMPANY (1933) LIMITED
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FACSIMILE MESSAGE

To : Transport Department	Attn : Mr Steven Tse
Fax No. : 2824 4255	Ref. : ENG/050/08/FL
Date : 17-12-2008	Pages : 3 (including this page)

Re: Investigation Report on The Fire Incident Involving MJ6852

Bus No./Route : MJ6852 (Route 113 Choi Hung – Kennedy Town)

Bus Type : Volvo B9TL/Wright 12m A/C D/D

License Date : 2 June 2006

Last COR Date : 6 March 2008

Last MD Date : 23 July 2008

Last MI Date : 14 November 2008

Incident

When the captioned bus, traveling along the Queen's Road East (West-bound) stopped at the Wu Chung House bus stop for alighting, some passengers indicated that there was smouldering smell. The bus captain noticed that smoke was emitting out from the rear and immediately managed to evacuate all passengers. After failed attempt to put out the fire by using the on-board fire extinguisher, the bus captain reported to the Police for assistance. The fire was extinguished by the Fire Services eventually.

*There has not been any report from the driver mentioning the explosion as quoted by the media. Presumably this was the glass shattering noise when the Fire Services broke the window glass.

Possible Cause

Based on the evidence found in the wreckage, the following event cascades that led to the fire incident were suggested:

1. The source of ignition was presumably the bearing of the No. 2 alternator which suffered from a bearing seizure which generated intense heat by the continuous rubbing and sliding motion driven by the alternator drive belt.
2. The intense heat caused the plastic cooling fan of the No. 2 alternator to catch fire which, subsequently, under the combined effect of air circulation inside the engine compartment (provided by the radiator cooling fan) and the burning of the rubber hoses of the engine air intake, the fire eventually got into the A/C unit compartment.

3. The fire ignited the insulation material inside the A/C unit and damaged the drain-pan of the evaporator and the fibre-glass air ducts connecting to the saloon air ducts.

Remarks

1. The bus type (Volvo B9TL/Wright 12m A/C D/D) involved in this fire incident has a good fire-safety record since it was introduced in 2006. In fact, MJ6852 is the first vehicle of this bus type that involved in a fire incident.
2. This fire incident could be described as exceptional:
 - (i) the alternator No. 2 could still operate (instead of stopping immediately as a consequence of the majority of other bearing seizure cases) despite the bearing seizure,
 - (ii) the alternator drive belt could still operate without breaking or even excessive slipping as in the case of the majority of other bearing seizure incidents.

Damage

1. Engine Compartment

- (i) The upper portion of the engine compartment was seriously fire-damaged.
- (ii) The oil master tank and the hydraulic oil tank were fire-damaged and empty.
- (iii) All hoses, cables insulation and insulations in the upper portion of the engine compartment were burnt away.
- (iv) Both alternators No. 1 & 2 were damaged.
- (v) Both alternator drive belt and A/C drive belt were broken (damaged by fire).
- (vi) The engine bonnet was burnt through in the upper middle position.

2. A/C Unit

- (i) All insulations and hoses inside the A/C unit were seriously fire-damaged.
- (ii) The evaporator drain pan was burnt away.
- (iii) All condenser fan blades were melted and burnt.

3. Chassis

The chassis was virtually intact, unaffected by the fire.

4. Bus Body

(i) Exterior

- a) The rear portion of the bus body was seriously fire-damaged.
- b) All window glasses (both U/S & L/S) at the rear were broken (presumably by the Fire Services).

(ii) Interior

- a) The ceiling of both U/S and L/S at the rear were fire-damaged
- b) The air ducts of both U/S and L/S at the rear were fire-damaged
- c) All passenger seats at the rear on both U/S and L/S were seriously damaged by the fire.

Injury/Fatality : Nil

Preventive Measures

The culprit of this fire incident was presumably the plastic-cage bearing being used for the main bearing in the alternator AC203RA which came with this vehicle type.

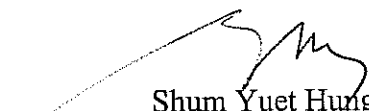
Though the plastic-cage bearings are commonly adopted for this kind of alternator and used worldwide, for reasons enhanced reliability/durability, the supplier has long been specifying brass-cage bearings for the main bearing of alternator application in the HK bus operating duty cycle, in particular for the high electrical demands of A/C buses.

This service issue has been identified two years ago and it was determined that those plastic-cage bearings came with the alternator in this new buses would be subject to a service improvement by replacing these with the brass-cage bearing in the period it goes through the first overhaul in 24-30 months which is the normal KMB maintenance practice for alternator.

So far, out of a total fleet of 64 Volvo B9TL/Wright 12m A/C D/D, 44 of these have already gone through the service improvement and have the bearings replaced leaving 20 buses (including MJ6852) which are under 24 months in service (under warranty) awaiting for bearing replacement.

The outstanding 19 buses (excluding MJ6852), whose alternator bearings have been checked to be in satisfactory and serviceable conditions would be arranged to have the bearing replaced by the end of this month in order to completely eliminate the fire potential of this kind of vehicle.

Regards



Shum Yuet Hung
Principal Engineer, Bus Engineering



By Fax

Fax no.: 2824 4255

Our Ref.: ETSM/047/2008

17 December 2008

The Commissioner of Transport
Transport Department
41/F Immigration Tower
7 Gloucester Road
Hong Kong

Attn: Mr. Steven Tse
Engineer (Bus)

Dear Sir,

Re: Bus Smoke Incident of GX8298 (Fleet No.: 924) at Cotton Road

We refer to your fax on 10 December 2008 regarding the above incident occurred on the same day. The following are the details of the incident for your information.

Date/Time : 10 December 2008 / 16:40
Incident Location : Cotton Road near Kennedy Road
Registration/Fleet No. : F/N 924 / GX 8298
Vehicle Type : Volvo Olympian MKII double deck bus
Date of 1st Reg : 07 October 1996
Last MI date : 21 November 2008
Last COR date : 23 September 2008
Chassis No. : YV3YNF214TC026800
Route No. : 40
Driver :
Casualties and Injuries : None
Incident Description : At the material time, bus GX8298 was travelling along Cotton Road. When it came near Kennedy Road, the Bus Captain ("BC") noticed that the vehicle was felt no power and smoke was emitting from the bus rear. There was no warning light up on the dashboard. He stopped the bus immediately, switched off the battery master switch and reported the matter to Citybus Operations Control Centre.

Police and Fire Services Department arrived at the scene shortly afterwards. There was however no observation that the Fire Services had done anything while they were there.

Physical Damage : The only physical damage is that the rear axle casing is broken.



Cause of Incident : It is suspected that the differential gears may have some teeth broken leading to consequential damage of the rear axle casing.

Oil mist was emitted through the broken casing hole and appeared like heavy white smoke.

Preventive Measures : The white smoke produced is not relevant to fire or smoke as an early symptom of fire under the normal language.

Nevertheless, we will conduct a fleet check of all Volvo Olympian MKII buses and identify any oil leakage from the rear axle. All problematic rear axles will be repaired or replaced accordingly. It is expected that the exercise will complete in one week. Finally, all depots have been asked to reinforce inspection in this area during regular maintenance.

Please do not hesitate to contact me if you have any queries and thank you for your attention.

Yours faithfully
For and on behalf of
Citybus Limited

Kenny So
Engineering Technical Support Manager

c.c.: HE, SESM, DM(WCH)