



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: June 27, 2007

In reply refer to: H-07-11

Motorcoach manufacturers
(See attached list.)

The National Transportation Safety Board is an independent Federal agency charged by Congress with investigating transportation accidents, determining their probable cause, and making recommendations to prevent similar accidents from occurring. We are providing the following information to urge your organization to take action on the safety recommendation in this letter. The Safety Board is vitally interested in this recommendation because it is designed to prevent accidents and save lives.

This recommendation addresses the use of materials and designs for fuel system components that are known to provide fire protection. The recommendation is derived from the Safety Board's investigation of the September 23, 2005, motorcoach fire on Interstate 45 (I-45), near Wilmer, Texas, during the Hurricane Rita evacuation and is consistent with the evidence we found and the analysis we performed. As a result of this investigation, the Safety Board has issued 17 new safety recommendations, 1 of which is addressed to 6 motorcoach manufacturers. Information supporting the recommendation is discussed below. The Safety Board would appreciate a response from you within 90 days addressing the actions you have taken or intend to take to implement our recommendation.

On September 23, 2005, a 1998 Motor Coach Industries, Inc., 54-passenger motorcoach, operated by Global Limo Inc., of Pharr, Texas, was traveling northbound on I-45 near Wilmer, Texas.¹ The motorcoach, en route from Bellaire to Dallas, Texas, as part of the evacuation in anticipation of Hurricane Rita, was carrying 44 assisted living facility residents and nursing staff. The trip had begun about 3:00 p.m. on September 22. Fifteen hours later, about 6:00 a.m. on the following day, a motorist noticed that the right-rear tire hub was glowing red and alerted the motorcoach driver, who stopped in the left traffic lane and then proceeded to the right shoulder of I-45 near milepost 269.5. The driver and nursing staff exited the motorcoach and observed flames emanating from the right-rear wheel well. As they initiated an evacuation of the motorcoach, with assistance from passersby, heavy smoke and fire quickly engulfed the entire vehicle. Twenty-three passengers were fatally injured. Of the 21 passengers who escaped, 2 were seriously injured and 19 received minor injuries; the motorcoach driver also received minor injuries.

¹ For more information, see <<http://www.nts.gov/publictn/2007/HAR0701.pdf>>. National Transportation Safety Board, *Motorcoach Fire on Interstate 45 During Hurricane Rita Evacuation, Near Wilmer, Texas, September 23, 2005*, Highway Accident Report NTSB/HAR-07/01 (Washington, DC: NTSB, 2007).

The National Transportation Safety Board determined that the probable cause of the accident was insufficient lubrication in the right-side tag axle wheel bearing assembly of the motorcoach, resulting in increased temperatures and subsequent failed wheel bearings, which led to ignition of the tire and the catastrophic fire. Global Limo Inc. had failed to conduct proper vehicle maintenance, to do pretrip inspections, and to complete posttrip driver vehicle inspection reports, thereby allowing the insufficient wheel bearing lubrication to go undetected. Contributing to the accident was the Federal Motor Carrier Safety Administration's ineffective compliance review system, which resulted in inadequate safety oversight of passenger motor carriers. Contributing to the rapid propagation and severity of the fire and subsequent loss of life was the lack of motorcoach fire-retardant construction materials adjacent to the wheel well. Also contributing to the severity of the accident was the limited ability of passengers with special needs to evacuate the motorcoach.

When fire burns in a confined space, the heat feedback from surroundings causes the material to burn more intensely. In this accident, the heat radiated by the glowing hub components and the confinement of the rubber tire within the wheel well significantly increased the rate at which the fire burned. From the burning 3R tire, the fire spread to adjacent tires, to other combustible wheel well area components,² and to the composite exterior of the motorcoach. In addition, significant amounts of diesel fuel from the fuel delivery system became involved and accelerated the spread of the fire during the incipient stage.

In the accident motorcoach, the fuel lines were routed through a centerline tunnel in the undercarriage. Two small access panels made of a combustible material separated the fuel lines from the wheel well. One access panel was completely consumed by fire, and the other was partially melted and deformed. The thermoplastic fuel lines were completely consumed by fire from the engine compartment to a point within 1 foot of the fuel tank. In motorcoaches, fuel lines located near engine compartments and service tunnels can burn through and provide volatile fuel to an existing fire, causing a significant increase in the fire hazard. In this accident, burnthrough occurred once the tire fire breached the two combustible access panels to the service tunnel and the fuel lines in the engine compartment. Therefore, the Safety Board concludes that, because of the proximity of the combustible access panels to the tire wheel well, where the fire originated, the fuel delivery system contributed to acceleration of the fire.

Replacement of the combustible access panel with a fire-resistant barrier might preclude the early involvement of fuel in a fire in the wheel well area and thereby limit the rate of fire spread. The National Highway Traffic Safety Administration (NHTSA) has developed a fuel system crashworthiness standard (Federal Motor Vehicle Safety Standard [FMVSS] 301) to limit the amount of fuel spill as a result of an accident and thus reduce the chance of a catastrophic postcrash fire. However, this FMVSS does not apply to motorcoaches. As a result, the Safety Board has recommended that NHTSA develop an FMVSS to provide enhanced fire protection of the fuel system in areas of motorcoaches and buses where the system may be exposed to the effects of a fire.

The National Transportation Safety Board therefore makes the following recommendation to motorcoach manufacturers:

² These components include bushings, mud flaps, and suspension system air bags.

Until the National Highway Traffic Safety Administration has developed a performance standard for enhanced fire protection of fuel systems in newly manufactured motorcoaches and included it in the *Federal Motor Vehicle Safety Standards*, as requested in Safety Recommendation H-07-4, use materials and designs for fuel system components that are known to provide fire protection for the system. (H-07-11)

The Safety Board also issued safety recommendations to the Federal Motor Carrier Safety Administration, the National Highway Traffic Safety Administration, the Pipeline and Hazardous Materials Safety Administration, the Fraternal Order of Police, the International Association of Chiefs of Police, the International Association of Fire Chiefs, the International Association of Fire Fighters, the National Association of State EMS Officials, the National Sheriffs' Association, the National Volunteer Fire Council, Motor Coach Industries, Inc., the United Motorcoach Association, and the American Bus Association. In addition, the Safety Board reiterated two recommendations to the U.S. Department of Transportation.

In your response to this letter, please refer to Safety Recommendation H-07-11. If you need additional information, you may call (202) 314-6177.

Chairman ROSENKER, Vice Chairman SUMWALT, and Members HERSMAN, HIGGINS, and CHEALANDER concurred in this recommendation. Member HERSMAN filed a concurring statement, and Member HIGGINS filed a concurring and dissenting statement, both of which are attached to the Accident Report.

[Original Signed]

By: Mark V. Rosenker
Chairman

Motorcoach manufacturers**ABC Companies**

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National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: June 27, 2007

In reply refer to: H-07-9 through -11

Mr. Robert L. Capstick
Director of Engineering
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Winnipeg, Manitoba R3T-1T5

The National Transportation Safety Board is an independent Federal agency charged by Congress with investigating transportation accidents, determining their probable cause, and making recommendations to prevent similar accidents from occurring. We are providing the following information to urge your organization to take action on the safety recommendations in this letter. The Safety Board is vitally interested in these recommendations because they are designed to prevent accidents and save lives.

These recommendations address the dissemination of information on wheel bearing lubrication and the use of materials and designs for fuel system components that are known to provide fire protection. The recommendations are derived from the Safety Board's investigation of the September 23, 2005, motorcoach fire on Interstate 45 (I-45), near Wilmer, Texas, during the Hurricane Rita evacuation and are consistent with the evidence we found and the analysis we performed. As a result of this investigation, the Safety Board has issued 17 new safety recommendations, 3 of which are addressed to Motor Coach Industries, Inc. (MCI). Information supporting the recommendations is discussed below. The Safety Board would appreciate a response from you within 90 days addressing the actions you have taken or intend to take to implement our recommendations.

On September 23, 2005, a 1998 MCI 54-passenger motorcoach, operated by Global Limo Inc., of Pharr, Texas, was traveling northbound on I-45 near Wilmer, Texas.¹ The motorcoach, en route from Bellaire to Dallas, Texas, as part of the evacuation in anticipation of Hurricane Rita, was carrying 44 assisted living facility residents and nursing staff. The trip had begun about 3:00 p.m. on September 22. Fifteen hours later, about 6:00 a.m. on the following day, a motorist noticed that the right-rear tire hub was glowing red and alerted the motorcoach driver, who stopped in the left traffic lane and then proceeded to the right shoulder of I-45 near milepost 269.5. The driver and nursing staff exited the motorcoach and observed flames emanating from the right-rear wheel well. As they initiated an evacuation of the motorcoach, with assistance from passersby, heavy smoke and fire quickly engulfed the entire vehicle. Twenty-three passengers

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were fatally injured. Of the 21 passengers who escaped, 2 were seriously injured and 19 received minor injuries; the motorcoach driver also received minor injuries.

The National Transportation Safety Board determined that the probable cause of the accident was insufficient lubrication in the right-side tag axle wheel bearing assembly of the motorcoach, resulting in increased temperatures and subsequent failed wheel bearings, which led to ignition of the tire and the catastrophic fire. Global Limo Inc. had failed to conduct proper vehicle maintenance, to do pretrip inspections, and to complete posttrip driver vehicle inspection reports, thereby allowing the insufficient wheel bearing lubrication to go undetected. Contributing to the accident was the Federal Motor Carrier Safety Administration's ineffective compliance review system, which resulted in inadequate safety oversight of passenger motor carriers. Contributing to the rapid propagation and severity of the fire and subsequent loss of life was the lack of motorcoach fire-retardant construction materials adjacent to the wheel well. Also contributing to the severity of the accident was the limited ability of passengers with special needs to evacuate the motorcoach.

The industry acknowledges that a motorcoach tire fire is the most difficult to extinguish; though detection systems may alert a driver to a potential fire situation, adequate suppression systems are not yet available. Therefore, fire prevention is the key objective. When fire burns in a confined space, the heat feedback from surroundings causes the material to burn more intensely. In this accident, the heat radiated by the glowing hub components and the confinement of the rubber tire within the wheel well significantly increased the rate at which the fire burned. From the burning 3R tire, the fire spread to adjacent tires, to other combustible wheel well area components,² and to the composite exterior of the motorcoach. In addition, significant amounts of diesel fuel from the fuel delivery system became involved and accelerated the spread of the fire during the incipient stage.

In the accident motorcoach, the fuel lines were routed through a centerline tunnel in the undercarriage. Two small access panels made of a combustible material separated the fuel lines from the wheel well. One access panel was completely consumed by fire, and the other was partially melted and deformed. The thermoplastic fuel lines were completely consumed by fire from the engine compartment to a point within 1 foot of the fuel tank. In motorcoaches, fuel lines located near engine compartments and service tunnels can burn through and provide volatile fuel to an existing fire, causing a significant increase in the fire hazard. In this accident, burnthrough occurred once the tire fire breached the two combustible access panels to the service tunnel and the fuel lines in the engine compartment. Therefore, the Safety Board concludes that, because of the proximity of the combustible access panels to the tire wheel well, where the fire originated, the fuel delivery system contributed to acceleration of the fire.

A comprehensive program of proper maintenance by motor carriers, pretrip inspections, posttrip vehicle inspections by drivers, State and Federal requirements, and inspections to verify motor carrier compliance with safety regulations is necessary to prevent motorcoach fires.

The maintenance manuals published by motorcoach manufacturers afford a means of fostering owner awareness of the risks associated with improper wheel bearing maintenance.

² These components include bushings, mud flaps, and suspension system air bags.

MCI placed caution and warning text boxes throughout its maintenance manual to provide additional information on the potential hazards of failing to properly maintain specific vehicle components and on methods for handling heavy vehicle parts. The manual cautioned that wheel seal integrity could be affected by excessive wheel bearing end play and lead to bearing or seal failure; no warning was given on the potential consequences of failing to maintain adequate wheel bearing lubrication, though daily checks of hub oil levels were recommended.

Maintenance guidance on vehicle components is based on manufacturers' recommendations because they are in the best position to understand how their products work, including the consequences of not performing proper maintenance. Although the maintenance manual for the accident motorcoach included various warnings, none focused on the lubrication of wheel bearings. The Safety Board concludes that, in the absence of a specific warning in the maintenance manual, owners of vehicles with oil bath bearings may not be aware of the inherent danger of inadequate wheel bearing lubrication and the potentially serious consequences of a wheel bearing failure.

Replacement of the combustible access panel with a fire-resistant barrier might preclude the early involvement of fuel in a fire in the wheel well area and thereby limit the rate of fire spread. The National Highway Traffic Safety Administration (NHTSA) has developed a fuel system crashworthiness standard (Federal Motor Vehicle Safety Standard [FMVSS] 301) to limit the amount of fuel spill as a result of an accident and thus reduce the chance of a catastrophic postcrash fire. However, this FMVSS does not apply to motorcoaches. As a result, the Safety Board has recommended that NHTSA develop an FMVSS to provide enhanced fire protection of the fuel system in areas of motorcoaches and buses where the system may be exposed to the effects of a fire.

The National Transportation Safety Board therefore makes the following recommendations to Motor Coach Industries, Inc.:

Revise your product maintenance manuals to emphasize the importance of wheel bearing lubrication, specifically warning that daily inspection of hub oil levels and wheel seals is vital to prevent wheel bearing failure and that bypassing this requirement is a dangerous practice that can lead to a wheel well fire or other serious consequences. (H-07-9)

For those vehicles already sold and in service, disseminate a customer advisory bulletin on the importance of proper wheel bearing maintenance, specifying the type of equipment or oil bath bearings that require an undercarriage inspection to detect wheel seal leaks and alerting customers to the serious consequences of lack of lubrication and subsequent wheel bearing failure. (H-07-10)

Until the National Highway Traffic Safety Administration has developed a performance standard for enhanced fire protection of fuel systems in newly manufactured motorcoaches and included it in the *Federal Motor Vehicle Safety Standards*, as requested in Safety Recommendation H-07-4, use materials and designs for fuel system components that are known to provide fire protection for the system. (H-07-11)

The Safety Board also issued safety recommendations to the Federal Motor Carrier Safety Administration, the National Highway Traffic Safety Administration, the Pipeline and Hazardous Materials Safety Administration, the Fraternal Order of Police, the International Association of Chiefs of Police, the International Association of Fire Chiefs, the International Association of Fire Fighters, the National Association of State EMS Officials, the National Sheriffs' Association, the National Volunteer Fire Council, other motorcoach manufacturers, the United Motorcoach Association, and the American Bus Association. In addition, the Safety Board reiterated two recommendations to the U.S. Department of Transportation.

In your response to this letter, please refer to Safety Recommendations H-07-9 through -11. If you need additional information, you may call (202) 314-6177.

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