

June 26, 2009

Mr. Kazuyoshi Kaneko,  
Minister of Land, Infrastructure, Transport and Tourism

Norihiro Goto, Chairman,  
Japan Transport Safety Board

On the opinion concerned with the heavy property loss without casualties  
in the Enoshima Line, Shonan Monorail Co. Ltd.

In view of the result of this accident investigation, the Japan Transport Safety Board expresses its opinions as follows to the Minister of the Land, Infrastructure, Transport and Tourism, pursuant to Article 28 of the Act for Establishment of the Japan Transport Safety Board.

#### Notes

It is highly probable that this accident was caused by the insufficient deceleration by the braking force due to the abnormal power running operation caused by that the VVVF inverter became not to recognize the operation of the master controller by the driver due to the effects by the noise. Therefore, the Minister of the Land, Infrastructure, Transport and Tourism should take the required measures on the following matters.

[1] It is likely that the recognition of the abnormal situation by the driver may delay, in the railway vehicles using the software for the accelerating and decelerating control such as the vehicles equipped with the VVVF inverter, because there was no sign such as abnormal sound or nasty smell in the vehicles when the vehicle continues the power running, opposing to the operation of the master controller by the driver, due to the abnormal processing by the software. Therefore, the information on this accident should be known well for the drivers and let them thoroughly again to stop the train immediately when noticed the abnormal power running or the reduction of the braking force in the train.

Besides, the method to stop the train immediately should be the method that could be implemented by the driver in the emergency, and the method, breaking the main circuit certainly when the abnormal processing by the software had occurred, in order to secure the braking force even when the illegal power running had occurred due to the abnormal processing by the software, should be let known well.

[2] The railway operators, the vehicle makers, and the makers of the electric devices for railways should commonly possess each other the information on the malfunction, etc., in the power electronics devices and the electronic devices such as the VVVF inverter, and accumulate the knowhow to prevent troubles, against the problems of the malfunction due to the noise in the railway vehicles. In addition, the synthetic studies on the problems of the electromagnetic compatibility in the vehicle such as the desirable grounding methods and the mounting of cables, in the vehicles using the power electronics devices and the electronic devices, etc., should be implemented.

[3] The sufficient consideration should be implemented in the design stage in order to achieve the function of its important roles to secure the safety such as the watch dog timer at the occurrence of the abnormal processing, when the control of the devices which are important to secure the safety, such as the device to control acceleration and deceleration of the train, the brake control device, the safety equipment, were implemented by the software.

[4] It is likely that the investigation of the causes of the troubles is difficult when the phenomena did not reappeared, because there are many cases that could be recovered easily by the reset treatment, etc., without remained the traces of the inconvenience, when the troubles due to the abnormal processing of the software and the temporary inconvenience of the electronic parts, in the vehicles which the accelerating and decelerating sequence were processed by the software such as the vehicle equipped with the VVVF inverter.

In order to improve the level of the investigation of the causes against such troubles, it should be studied to equip the function to record the operation by the driver and the corresponded behavior of the vehicle in the independent devices, in the vehicle which the accelerating and decelerating sequence is processed by the software.