

Executive Summary

On October 12, 2023 at 10:40 a.m., a commercial freight tractor operated by Chang Hong Transportation Co., Ltd. carrying a sodium hypochlorite tanker trailer was eastbound on Provincial Highway No. 2 (two lanes in both directions with a speed limit of 50 km/h). It entered the left turn curve at 102K+047 at a speed of about 70 km/h, where it tilted significantly to the right and then overturned at 102K+115. The tractor trailer crashed into the outer guardrail and continued to roll, and finally stopped in the grass outside of the shoulder at 102K+140. The front of the tractor was severely deformed, the tank body and cover on top were damaged, and the sodium hypochlorite leaked onto lanes in both directions. The driver was killed in the occurrence.

In accordance with the Transportation Occurrence Investigation Act, the Taiwan Transportation Safety Board (TTSB) is an independent transportation occurrence investigation agency and responsible for conducting the investigation. The investigation team also included members from Highway Bureau, Ministry of Transportation and Communications, Chang Hong Transportation Co., Ltd., and the Juridical Association China Association for Labour.

The draft for this investigation report was completed in August 2024, and then, according to procedures, sent to relevant agencies (institutions) for their opinions. After summarizing relevant opinions, the investigation report was reviewed and approved in the TTSB's 69th Board Meeting on November 8th, 2024, and the final report was released on November 21st, 2024.

After comprehensive investigation and analysis of the factual data, a

total of 10 findings and 8 safety recommendations were obtained.

I. Investigation Findings

Findings Related to Probable Causes

1. The occurrence vehicle drove onto the opposite lane in the opposite direction to overtake a vehicle in the front, and took a sharp turn into the left turn curve, causing the radius of the vehicle's driving trajectory to be smaller than the curvature radius of the roadway, which also reduced the critical rollover speed. The occurrence vehicle was overloaded, speeding, and the speed was higher than the critical rollover speed. Most of the weight was concentrated on the trailer, which tilted towards the outer side of the curve of the roadway, and the tractor also tilted due to the trailer pulling it to the right, eventually causing the vehicle to overturn. (1.8, 1.9, 2.1)

Findings Related to Risks

1. According to current periodic tank inspection mechanism, MOTC approved tank inspection agencies cannot effectively detect when operators fail to make changes to the tank in accordance with regulations; the supervisory authorities are also unable to effectively supervise the quality of inspections performed by tank inspection agencies, which may affect transportation safety due to vehicles transporting dangerous goods in modified tanks that are not compliant with regulations. (1.15.2, 2.2.2)
2. After Chang Hong Transportation Co., Ltd. outsourced transportation business to Jin Tai Yang Transportation Co., Ltd (Jin Tai Yang), there was no verification mechanism to verify the operations of Jin Tai Yang,

so it was unable to detect that the occurrence vehicle was overloaded, lacked adequate warning signs, and failed to correctly label the contents being transported. (1.14.1, 1.15.2, 2.2.3)

3. The speed limit of the occurrence area is 60 km/h, which already exceeds the estimated roadway design speed. When a vehicle travels at a speed of 60 km/h along this horizontal curved road section, there might be the risk of slip or rollover. (1.8.1, 2.3.2)
4. When the occurrence vehicle completed the overtaking, the shortest driving distance on the opposite lane was 162 to 233 meters. The occurrence vehicle failed to overtake the front vehicle within the 125-meter-long dashed yellow line where overtaking is permitted, showing that it does not provide a sufficient distance for safe overtaking. (1.8.1, 2.3.3)

Other Findings

1. The occurrence driver held a valid driver's license issued by Highway Bureau, MOTC and a valid Transportation Hazardous Goods by Road Training Certificate. There was no evidence to indicate that the driver's performance might have been affected by fatigue due to lack of sleep or scheduling, alcohol, and drugs. The occurrence vehicle's maintenances and inspections were legally documented, tires and braking systems were functioning normally. (1.3.2, 1.5.1, 1.5.3, 1.6.2, 1.6.3)
2. The tank of the occurrence vehicle was not the original tank that was initially constructed, and Chang Hong Transportation Co., Ltd. did not register the change to the tank in accordance with regulations. (1.6.1, 1.15.2, 2.2)

3. The filled volume of the occurrence vehicle's tank exceeded 90%, so the free surface effect of the content was relatively small. Therefore, failure to install baffles in this occurrence should have had little effect on the overturning, but the potential effect of lack of baffles cannot be completely ruled out. (1.3.1, 2.2.1)
4. When the inspector was performing the inspection, the inspector wrote that the "Baffle" item "Passed" on the inspection record form, despite there being no baffles in the tank of the occurrence vehicle, which was inconsistent with the actual vehicle condition. During the completion inspection, the inspector conducted the inspection by adding the inspection item "Anti-roll device" in the "Others" column of the inspection record form. During subsequent periodic inspections, the inspection item "Anti-roll device" was not recorded because it was not on the standard inspection record form. (1.6.1, 2.2.2)
5. The Northern Region Branch Office, Highway Bureau, Ministry of Transportation and Communications did not retain relevant drawings and information on the original roadway engineering design of Provincial Highway No. 2. Maintenance of the roadway is only carried out based on its current condition, which may result in the roadway alignment standard becoming lower than the original design standard after maintenance, causing potential driving safety risks. (1.8.1, 2.3.1)

II. Safety Recommendations

To Chang Hong Transportation Co., Ltd.

1. Strengthen drivers' driving safety concepts when overtaking to avoid overturning due to speeding or sharp turns when entering curved roadways.

2. Establish a verification mechanism to monitor the status of outsourced operations management companies, in order to avoid overloading, lack of adequate warning signs, and failure to correctly label the contents being transported.

To the Juridical Association China Association for Labour

1. Supervise inspectors to properly conduct inspections according to the inspection record form, in order to ensure that the condition of all parts of the tank meets standards.

To the Ministry of Transportation and Communications

1. Establish standards for the shortest length of overtaking permitted distance on road sections at different design speeds, which will serve as the basis of shortest interval length of continuous no overtaking road sections, thereby improving the driving safety during overtaking.

To the Highway Bureau, MOTC

1. Strengthen the periodic inspection mechanism for MOTC approved tank inspection agencies to ensure that inspectors are able to properly perform inspections, in order to improve the inspection quality of tank inspection agencies.
2. Review the sight distance for overtaking before horizontal curved road sections and the length of dashed yellow lines where overtaking is permitted on two-lane two-way road sections under jurisdiction, in order to ensure that there is sufficient distance for safely overtaking and that vehicles can complete overtaking within dashed yellow lines.
3. Review the data element for various construction projects in the highway inventory database and assess to complete data and drawings

related to highway engineering and traffic engineering under jurisdiction, and use these as the basis for highway maintenance and formulating improvement plans. (This is an existing safety recommendation and still controlled by relevant sub-projects. This is the second time it has been proposed. Please refer to safety recommendation number TTSB-HSR-23-03-008 of the previous case when handling this recommendation.)

4. Review the appropriateness of the design speed and speed limit of highways under jurisdiction. If the speed limit needs to be higher than the design speed, ensure that all types of vehicle are capable to drive safely within the speed limit, otherwise geometric conditions of the roadway or traffic engineering facilities need to be immediately improved to ensure safety. (This is an existing safety recommendation and still controlled by relevant sub-projects. This is the second time it has been proposed. Please refer to safety recommendation number TTSB-HSR-22-11-015 of the previous case when handling this recommendation.)