Executive Summary

On November 30, 2020, a class II commercial tour bus (license plate number: 568-TT) operated by Kao Tung B Co., Ltd. (hereinafter referred to as "KTB") carried a total of 20 passengers (including an accompanying service personnel for a tourist group), who were on a 1-day tour and traveling from Kaohsiung City to Cingjing Farm and the Aowanda National Forest Recreation Area (hereinafter referred to as "ANFRA"). At 12:33:28, the vehicle involved in the accident (hereinafter referred to as "the vehicle") overturned at the 1K+480 downhill bend of the dedicated road (Da'an Road) for accessing the ANFRA, Nantou County. The accident caused damage to the car body, the death of one passenger, and 20 persons were injured, including the tour bus driver and passengers.

According to the relevant articles of the Transportation Occurrences Investigation Act of the Republic of China, the Taiwan Transportation Safety Board (hereinafter referred to as "TTSB") was the independent agency responsible for investigating this accident. The agencies (institutions) invited to participate in this investigation comprise the Directorate General of Highways (hereinafter referred to as "DGH") of the Ministry of Transportation and Communications (hereinafter referred to as "MOTC"), the Forestry Bureau of the Council of Agriculture of the Executive Yuan, Sanyang Motor Co., KTB, and the Happiness Tour agency.

In accordance with relevant procedures, the occurrence investigation draft report, which was completed in March 2022, was preliminarily reviewed and revised at the TTSB's 37th board meeting on April 1, 2022, and submitted to the relevant agencies (institutions) for comments. An investigation report integrated with relevant comments was deliberated and approved at the TTSB's 39th board meeting on June 2, 2022, before it was released on June 30, 2022.

On the basis of factual information and the results of an analysis, a total of 19 findings and 11 transportation safety recommendations were proposed through the accident investigation.

Investigation Findings

Findings Related to Probable Causes:

1. Before the accident, the brake pad of the vehicle's brake shoe was lower than the standard value. In addition, the high water content of the brake oil was vaporized because of high temperature, leading to the weakening of the brake pedal, insufficient braking force, or brake failure.

2. When the driver involved in the accident (hereinafter referred to as "the driver") was driving the vehicle on the downhill section of the dedicated road for accessing the ANFRA, he was driving at excessive speed. The driver probably tried to downshift by first depressing the clutch and then the brake pedal. The deceleration failed because of the weakened brake pedal, insufficient braking force, or brake failure. Finally, the vehicle rolled over to the left across to the opposite lane when it was cornering on the downhill section.

Findings related to the risks:

1. During the period when the vehicle traveled on the downhill section of Tao Line 83, the following situation reoccurred: the vehicle engine speed was 800 or 900 rpm, the vehicle speed was between 30 and 40 km/h, and the brake lights were activated. Analyzing the comparison table of the gear position and rotational speed of the vehicle's transmission gear ratio indicated that the driver had probably depressed the clutch during the extended downhill driving phase, which caused the engine to rev down and increased the speed of the vehicle. At the same time, the driver probably depressed the brake

pedal to control the speed, which generated a high temperature in the brake system and probably accelerated the wear of the brake pad.

2. The auto maintenance and repair shop failed to follow the recommended cycle as indicated in the original equipment manufacturer (OEM) maintenance manual or only performed maintenance in accordance with the owner's requests, which could have led to inadequate vehicle maintenance or repair and, consequently, increased vehicle safety risks.

3. The routine maintenance of the commercial large passenger vehicles is managed by operators in the auto repair industry and inspected by motor vehicle offices or outsourced automotive inspection stations. However, the current regular inspection mechanism could not effectively verify the vehicle maintenance conditions conducted by the aforementioned operators.

4. On the day before a scheduled regular inspection of the vehicle, San Wei Car Company adjusted the brake clearance of the vehicle and checked the unimplemented items in a record form.

5. For the regular inspection of a commercial large passenger vehicle, the commercial large passenger vehicle maintenance record form and maintenance and repair (work) sheet issued by legitimate auto repair operators must be submitted. Although the record form stipulates the required maintenance types and details, no regulations were implemented to ensure the completeness and correctness of the aforementioned sheet, which was filled out by the aforementioned operators. Furthermore, no mechanism was implemented to ensure that these operators maintained and repaired the commercial large passenger vehicles in accordance with the OEM-recommended cycle. Under the circumstance that it was impossible to ensure that the aforementioned auto repair operators appropriately completed the maintenance and repair work, the follow-up vehicle inspections can be

carried out with the certified commercial large passenger vehicles maintenance record form.

6. KTB did not keep the complete pre-departure check record form of the vehicle; consequently, the investigation team could not confirm whether the employed driver followed the regulations stipulated by the Directorate General of Highways (hereinafter referred to as "DGH") and properly filled out the pre-departure check record form. Furthermore, KTB could not effectively check the vehicle's pre-departure status; thus, it did not meet the DGH's requirements regarding operators' self-management.

7. Because of the high water content in the brake oil of the vehicle, after extended use of the vehicle's brakes, the brake oil in the brake system was probably vaporized by the high temperature that was generated, leading to insufficient braking force. The driver could not detect this by conducting a pre-departure check, and the operator could not learn about the status of the vehicle's brake system through the pre-departure check record form.

8. Under the current safety assessment mechanism implemented for the tourist bus transportation enterprise, motor vehicle inspection offices cannot review the data of all the vehicles of an operator when they are conducting a safety assessment, and the offices also cannot effectively verify the completeness and correctness of the self-inspection data of the operator; thus, unable to detect in time the situation of operators' self-management.

9. The passengers who fastened their seat belts were secured and protected. During the accident, they generally sustained minor injuries; by contrast, the injuries of the five passengers who did not fasten their seat belts were more serious, and one of them was even thrown out of the vehicle and killed in this accident.

10. In the Ja LA Da 279-VV occurrence report on major highway accidents involving tour buses, the board recommended that the Ministry of Transportation and Communications (hereinafter referred to as "MOTC") accelerate the implementation and completion of the legislation requiring backseat passengers in large passenger vehicles to fasten their seat belts. As stipulated in Article 31 of the Road Traffic Management and Penalty Act, which was amended and approved by the Legislative Yuan on December 15, 2021, passengers who are aged four years or older and being carried in a large vehicle must fasten their seat belts. However, the amended provision only applies to freeways or expressways and not to general and mountain roads.

Other investigation findings:

1. From the day of the vehicle's latest brake oil replacement to the day of the accident, the driving distance of the vehicle had already exceeded 100,000 km, and none of the records indicated that an additional brake oil replacement was performed during this period. During the period between the latest replacement of the front brake pad and the day of the accident, the driving distance of the vehicle was already more than 170,000 km. None of the records indicated that an additional brake pad replacement was performed during this period.

2. After the abolishment of the Auto Repair Industry Management Regulations on December 5, 2001, no regulations are no place to manage vehicle safety matters such as the presence of qualified technicians in auto maintenance and repair shops and the methods for recording maintenance and repair work.

3. The vehicle was mounted with a valid license issued by the relevant supervisory authority. According to the images extracted from the driving vision assistant system and vehicle test results obtained following the

accident, the wheels and steering system of this vehicle did not exhibit any abnormalities.

4. The construction of the road segment involved in the accident did not exhibit any abnormalities, but the speed limit sign at 0K+020 was faded and unclear. At the time of the accident, the weather was sunny, and visibility at the accident site was high.

5. The driver had a valid driving license (issued by the DGH) and a tourist bus transportation enterprise driver registration certificate. He had also completed a pre-employment program workshop for tour bus driver registration as well as regular training in accordance with regulations.

6. No evidence was found to indicate that the driver's vehicle operation performance during this accident was influenced by the negative effects of fatigue, medication use, or alcohol use.

7. After the accident occurred, the doors and emergency exits could not be used, and the windows on both sides were suspended or close to the ground, making them unsuitable for use. In this situation, the passengers could only evacuate through the front windshield.

Safety Recommendations

<u>For KTB</u>

1. Enhance the understanding of employed drivers regarding proper gear shifting and braking during extended downhill driving and implement driving safety training.

2. Fully implement the company's self-management system; properly fill out and maintain the documents required for safety assessments to meet DGH requirements regarding operator self-management.

3. Implement the maintenance work for company-owned vehicles and ensure that all vehicles undergo regular maintenance.

For the DGH of the MOTC

1. Develop a procedure or mechanism for system maintenance items that are associated with commercial large passenger vehicle safety; the purpose of this procedure or mechanism is to ensure that auto repair industry operators can perform maintenance work in accordance with the OEM-recommended maintenance cycle. The procedure or mechanism provides a reference that motor vehicle inspection offices or outsourced automotive inspection stations can use during inspections and helps to increase driving safety.

2. Build a safety assessment mechanism that allows for the immediate verification of the completeness and correctness of the self-inspection data of tourist bus transportation enterprise operators (e.g., an information-based management system for the routine uploading of data by operators such as dispatch orders and pre-departure check record forms) to enable the timely detection of their routine self-management status.

3. Enhance the mechanism for tour bus safety inspection recordkeeping (such records should detail the abnormalities exhibited by a vehicle during driving); ensure that drivers and tourist bus transportation enterprise operators understand the conditions of their vehicles before and after driving.

4. Enhance the safety assessment of the brake system maintenance work conducted for large passenger vehicles during the implementation of large passenger vehicle maintenance.

5. Guide tourist bus transportation enterprise operators to enhance their employed drivers' understanding of proper gear shifting and braking during extended downhill driving and to implement driving safety training.

6. Guide KTB to complete its self-management work and to properly fill out and maintain the documents required for safety assessments, enabling it to meet DGH requirements regarding operator self-management.

For the MOTC

1. Re-examine the procedures and mechanisms for the regular inspection of the brake systems of large passenger vehicles (e.g., the procedure for outsourcing vehicle inspection) to ensure that auto repair operators properly maintain commercial large passenger vehicles and meet the requirements for regular commercial large passenger vehicles inspection.
2. Incorporate and update regulations pertaining to tourism businesses that are operated by the tourist bus transportation enterprise; backseat passengers should be required to fasten their seat belts, and this requirement should apply to all types of roads in addition to freeways and expressways.