SUMMARY

DERAILMENT OF 13 WAGONS OF A FREIGHT TRAIN AT VAMMALA STATION, FINLAND, ON 6 APRIL 2013

At 3.22 a.m. on 6 April 2013, freight train 3703 en route from Tampere to Rauma derailed at the Vammala station in Sastamala. The train was proceeding as planned, until at the Vammala turnout V003, the rear bogie of wagon 15 or the front bogie of wagon 16 was directed between the switch blades and the stock rails of the turnout. As a consequence, the rear end of the train began to derail. Two Russian tank wagons tipped over and the train broke into two parts. Nine Finnish freight wagons derailed. The intermediate wagon between the Russian tank wagons and the Finnish freight wagons derailed to the left, causing minor damage to the track to the left of the train's direction of travel. The 16 wagons at the end of the train remained on the rails. The front end of the train, the locomotive and 15 wagons continued moving for another 314 metres after the brake pipe was broken. The rear bogie of the last wagon at the front end of the train ran off the rails and broke some sleepers. According to the locomotive's data recorder, the train's speed at the moment of derailment was 67 km/h.

There were no personal injuries. A total of 13 wagons derailed during the accident. Two Russian tank wagons were damaged beyond repair after they had derailed and tipped over. The intermediate wagon following the tank wagons, and a wagon loaded with empty containers that came after the intermediate wagon, were badly damaged. The damage caused to the other nine derailed wagons was not as extensive. Tracks were damaged at a distance of 177 metres and the concrete sleepers of one track were damaged at a distance of 249 metres. A small amount of crude tall oil leaked onto the ground from one of the tank wagons that tipped in the accident. The total costs caused by the accident were € 940,000.

The derailment was caused by the switch turning underneath the train. The train caused the open switch blade to move, resulting in the opening of the switch lock, which allowed the switch to turn. When an open switch blade is subjected to vibration or sufficiently powerful impacts, a switch lock that allows trailing may become unlocked. As a result, the closed switch blade opened and the wagon wheels fell between the switch blade and the stock rail.

Vibration affecting the open switch blade was caused by several factors. The Railex locking device had been adjusted eccentrically, in deviation from the specifications in such a manner that the gap between the open switch blade and the stock rail was 10 mm too small. This allows the inner surface of the flange of a train wheel to impact against the open switch blade. This is more likely in the case of Russian rolling stock, in which the distance between the inner surfaces of the wheel flanges is 5 mm less than in Finnish rolling stock.

Vibration may also be caused by lateral movement in the Russian stock which is, due to the wheel profile, greater than in Finnish stock. This causes the inner surface of the wheel flange to run close to open switch blades more often in Russian stock than in Finnish stock; when the equipment is within the nominal values, it can move a maximum of 5 mm closer. The vibration frequency caused by the speed and axle spacings suited the vibration characteristics of the turnout.

The accident had several causes. It seems to be typical of safety management that, on a general level, the systems and instructions are well described but they are not realised in practice. Detected safety deviations had been systematically left unreported. Repeated trailing notifications had been made for at

least twelve months, but had been disregarded. It had become habitual to leave trailing notifications caused by the passage of trains unreported due to their being so common and, on the other hand, because maintenance personnel had been unable to determine the cause of the trailing notifications. In addition, the log data available in the railway safety system had not been examined and analysed. There were deficiencies in the management of competencies related to turnout maintenance. Lately, no training has been provided in turnout maintenance. It also became apparent during the investigation that up-to-date instructions were not sufficiently available to those performing practical work. Quality control of work in the field is insufficient. Additionally, documentation for turnout maintenance was found to be lacking.

In order to avoid similar accidents in the future, the Safety Investigation Authority, Finland recommends that the Finnish Transport Safety Agency (Trafi) ensure the implementation of the following new recommendations:

- The Finnish Transport Agency should establish a system and methodology for the analysis of error logs of safety systems, to ensure the detection of any repeated flaws endangering safety.
- The Finnish Transport Agency should establish a system to ensure that the reason and justification for using a critical command are recorded. This justification will be used to show that no actual flaw remains in the system after the command has been used.
- The Finnish Transport Agency should convert the electric point machines of the trailable YV60-300-1:9 turnouts used on the main tracks, in order to prevent vibration caused by rolling stock from unlocking the switch lock.
- As the infrastructure manager, the Finnish Transport Agency should draw up a clearly defined turnout maintenance training programme and establish a system for continuous monitoring of the competencies of personnel carrying out turnout maintenance and adjustment work.

We also repeat our earlier recommendation S293:

The installation, inspections and maintenance of switches and their components should be seamlessly documented. [B5/09R/S293]